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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 13
JULY 1, 1976

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 13
JULY 1, 1976

W76-06151 -- W76-06800

he Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the ransaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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SUBJECT INDEX

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

THERMODYNAMIC PROPERTIES OF BULK AND OCCLUDED SUPER-COOLED WATER AND IONIC SOLUTIONS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
C. A. Angell.
Available from the National Technical Information Service, Springfield Va 22161, as PB-251 543, $4.00 in paper $2.25 in microfiche. OWRT BI051-IND (7). Techincal Report No. 75, January 1976. 29 p, 11 fig, 20 ref.

Descriptors: *Thermodynamic behavior, *Supercooling, *Thermal capacity, *Nucleation, Crystallization, Freezing, *Physiochemical properties, Thermal properties, *Compressibilty, Infrared spectra, Emulsions, *Aqueous solution, *Water properties, Ions, Water structure, *Electrolytes, Water types, Water analysis, Analytical techniques, Infrared radiation, Measurement, Expansivity, Infrared spectra.

Techniques have been developed for performing quantitative determinations, of the heat capacity, compressibility, and near infrared spectra, of pure water, D20, and their electrolyte solutions under conditions of supercooling amounting to as much as 38C in the case of pure water and > 120C for certain concentrated electolyte solutions. In the latter cases glasses form, and some of their properties have been determined. In the case of pure water, which has been the focus of this study, remarkable anomalies are encountered in the supercooled regime. The heat capacity, compressibility, and negative expansivity are increasing exponentially with decreasing temperature according to a function which suggests the existence of a thermodynamic singularity at -45C. This phenomenon is dependent on extended water-water interactions since it is rapidly eliminated by addition of elctrolytes such as LiC1. Alternative interpretations of these phenomena are discussed, with focus on the possible existence of internal liquid phase lambda transitions associated with open hydrogen bonded networks or the existence a low temperature limit on the mechanical stability of water as a liquid phase. A concentrated aqueous electrolyte solution, 5.5 m lithium acetate, is found to form a glass for which the glass transition temperature pressure dependence is negative, the first such example on record.
W76-06155

1B. Aqueous Solutions and Suspensions

THERMODYNAMIC PROPERTIES OF BULK AND OCCLUDED SUPER-COOLED WATER AND IONIC SOLUTIONS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 1A.
W76-06155

2. WATER CYCLE

2A. General

LEVEL OF CLOSED BODIES OF WATER AS ONE OF THE CRITERIA OF GLOBAL WATER EXCHANGE,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
G. P. Kalinin, and R. K. Klige.
Soviet Hydrology, Selected Papers, No. 6, p 534-538, 1973. 6 fig, 7 ref. Translated from (Water Resources) Vodnyye resursy, No. 6, p 3-8, 1973.

Descriptors: *Water level fluctuations, *Lakes, *Oceans, *Humidity, Precipitation(Atmospheric), Runoff, Evaporation, Surface waters, Volume, Sea level, Water levels.
Identifiers: *Closed lakes, *USSR.

The total volume of water contained in the lakes of the earth is about 750,000 cu km and the total area of the lakes is about 2.7 million sq km. The life of these bodies of water is very closely related to the total hydrologic budget of our planet. It is natural, therefore, that the volume of lakes, their surface area, and the water level in them depend on the total humidity of the continents. This relation is most pronounced for closed lakes whose surface area is fairly large. These lakes are unique indicators of climatic variations. When the humidity of continents increases, so does the volume of closed lakes, their level rises, and their surface area increases. Conversely, the area of closed lakes decreases markedly during dry periods. An analysis of fluctuations in the level of the world's largest closed lakes showed a definite tendency toward a drop in the last century. There is a definite relation between the change in the level and volumes of the largest closed lakes and that of the World Ocean. For the ocean level regime it is practicaly immaterial whether the land water will be supplied by river or atmospheric runoff while water exchange is changing i.e., a change in runoff may have no effect on the ocean level. The situation is essentially different for lakes, since most of the moisture evaporated from the lake surface is carried beyond the limits of the lake's drainage basin. Therefore, a change in river runoff leads to a direct change in the equilibrium level of a lake. (Sims - ISWS)
W76-06179

OPTIMUM DREDGED DEPTH IN INLAND WATERWAY,
CACI, Inc., Arlington, Va.
For primary bibliographic entry see Field 2J.
W76-06182

DATA COLLECTION SYSTEMS AND THEIR IMPACT ON THE FUTURE DEVELOPMENT OF HYDROLOGY,
Department of the Environment, Reading (England). Water Data Unit.
For primary bibliographic entry see Field 7A.
W76-06277

METHOD FOR DETERMINATION OF DESIGN STORMS WITH LOCALLY NONUNIFORM DISTRIBUTION (VERFAHREN ZUR ERMITTLUNG EINES 'BERECHNUNGSREGENS' MIT ORTLICH UNGLEICHMAESSIGER VERTEILUNG),
F. Sieker.
Wasserwirtschaft, Vol. 65, No. 11, p 293-296, 1975. 4 fig, 1 tab, 5 ref.

Descriptors: *Design storm, *Precipitation(Atmospheric), *Statistical methods, *Rainfall, *Storm water, Mathematical models, Analytical techniques, Distribution.

Applying multi-variable statistical variance analysis design storms with locally nonuniform distribution patterns can be developed. This analysis approach takes into account the stationary nonuniform rainfall-distribution due to orographic and topographic irregularities, the ratio between longitudinal and lateral expansion of rainfall areas as well as directional effects, the rainfall-occurrence-probability related to the average intensity of that rainfall, and causally nonattachable irregularities. The method is illustrated in this article by an example using daily precipitation curves. (Loustau-FIRL)
W76-06299

DISTRIBUTION FUNCTIONS LIMITED AT THE ORIGIN (IM URSPRUNG BEGRENZTE VERTEILUNGSFUNKTIONEN),
P. H. Mueller, W. Traus, and H. Vahl.
Wasserwirtschaft, Vol. 65, No. 11, p 296-301, 1975. 2 fig, 7 tab, 14 ref.

Descriptors: *Statistical methods, *Mathematical studies, *Hydrology, *Time series analysis, Synthetic hydrology, Distribution.
Identifiers: *Hydrological time series.

In order to better adapt a hydrological time-series to the actual physical conditions, it is desirable to transform left limited distribution functions in such a way that they begin in the origin. A method for performing this transformation was applied to the Pearson-Type-3-Distribution and to the Extremal-Type-3-Distribution. The K-values of the distribution functions gained in this way have been computed. For the simple application of the chi squared test, the tables for the standardized density functions have also been added. (Orr-FIRL)
W76-06316

EARTHWATCH,
National Oceanic and AtmosphericAdministration, Rockville, Md. Deep Water Ports Project Office.
For primary bibliographic entry see Field 5A.
W76-06321

CONTROLLING POLLUTION FROM COMBINED SEWERS,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W76-06328

A COMBINED MODEL OF WATER TABLE AND RIVER STAGE EVOLUTION,
Colorado State Univ., Fort Collins. Engineering Research Center.
H. J. Morel-Seytoux.
Water Resources Research, Vol. 11, No. 6, p 968-972, December 1975. 29 ref. OWRT B-109-COLO(6). 14-31-0001-4067.

Descriptors: *Surface-groundwater relationships, Streamflow, *Aquifer systems, *Aquifer characteristics, *Groundwater movement, *Simulation analysis, *Model studies, Aquifers, Pumping, Flood stages, Flood flow, Return flow, Hydrology, Hydraulics, Momentum equation.
Identifiers: Pumping rates, Aquifer interaction, Kernels, Muskingum routing, Gaussian algorithm, Mathematical simulation.

An integral equation was derived which completely characterizes the interaction between a stream and the alluvial aquifer. Expressed in finite difference form, the equation was of great practical utility in solving flooding problems (i.e., negligible effect of pumping on river flows) as it relates river stages to return flows. It was also useful to solve pure conjunctive use of surface water and groundwater problems (i.e., negligible river stage fluctuations) as it relates return flows to pumping rates, or to solve composite problems. The numerical procedures to calculate the response function coefficients in terms of the physical characteristics of the system were given in detail. (Terstriep-ISWS)
W76-06380

MODELING TECHNIQUES FOR GROUNDWATER EVALUATION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2F.
W76-06413

RAINFALL-RUNOFF DATA FROM SMALL WATERSHEDS IN COLORADO, OCTOBER 1971 THROUGH SEPTEMBER 1974,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-06446

GEOLOGIC AND WATER-SUPPLY REPORTS AND MAPS--WYOMING, JULY 1975,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 10C.
W76-06456

OPTIMAL SAMPLING AND OBJECTIVE ANALYSIS,
Eddy (Amos), Inc., Norman, Okla.
For primary bibliographic entry see Field 2B.
W76-06609

HYDROLOGICAL FORECASTING PRACTICES.
World Meteorological Organization, Geneva (Switzerland). Working Group on Hydrological Forecasting.
Operational Hydrology Report No. 6, WMO - No. 425, 1975. 122 p, 35 fig, 1 tab, 158 ref.

Descriptors: *Hydrology, *Forecasting, Floods, Water resources, Flood stages, Flood forecasting, Snowmelt, Human population, Discharge(Water), Rainfall, Rivers, River flow, Rainfall-runoff relationships, Water supply, Ice, Reservoirs, Navigation, Reach(Streams), Freezing.
Identifiers: *Hydrological forecasting, Human lives, Snowmelt floods, Rainfall-induced floods, Ice break-up, River navigation.

Basic principles of, and approaches to, hydrological forecasting were summarized for readers with little previous exposure to the subject. The first three chapters included introductory material placing hydrological forecasting in the broader perspective of hydrology separate from water resources. The term was defined as a prediction of the occurrence of a hydrological event specified both with respect to its quantitative measure and its actual time of occurrence, as opposed to a statistical prediction. The data needed for forecasting were listed as raw material. The most important specific types of hydrological data were described in chapters 4 to 9. Flood forecasting was described as well as possibilities of predicting water supply within long periods of time. There was a chapter on low flows in rivers, that is, the rate at which the water supplies of a basin vanish when there is no water input. Ice phenomena on rivers and reservoirs were discussed from the river navigation standpoint. The report ended with an evaluation of the effectiveness of forecasting methods and the degree of success of operational hydrological forecasts. (Roberts - ISWS)
W76-06633

A GENERALIZED STREAMFLOW SIMULATION SYSTEM, CONCEPTUAL MODELING FOR DIGITAL COMPUTERS,
National Weather Service, Sacramento, Calif. River Forecast Center.
R. J. C. Burnash, R. L. Ferral, and R. A. McGuire.
Joint Report, National Weather Service and California Department of Water Resources, March 1973, 204 p, 28 fig, 12 ref, 2 append.

Descriptors: *Rainfall-runoff relationships, *Hydrologic systems, *Hydrology, *Simulation analysis, *Streamflow, *Computer models, Infiltration, Evapotranspiration, Percolation, Hydrologic cycle, Subsurface runoff, Storage, Drainage, Soil moisture, Precipitation(Atmospheric).
Identifiers: Conceptual models, *Streamflow simulation, Upper zone storage, Lower zone storage.

The hydrologic simulation model described is a conceptual system for modeling the headwater portion of the hydrologic cycle. It was based on a system of percolation, soil-moisture storage, drainage, and evapotranspiration characteristics representing significant hydrologic processes. The definition of model parameters was achieved by establishing a soil-moisture computation which allows the determination of basin stream flow from basin precipitation. Simulation was normally done using a 24-hour time increment, although a shorter increment can be used. Model parameters are physically based and can be estimated from rainfall-runoff data. The program has gone through several generations of development and has been tested on eight geographically diverse basins totaling 70 station-years of data. (Terstriep-ISWS)
W76-06634

SYNTHESIS OF BASIN RESPONSE WITH INADEQUATE DATA,
Osmania Univ., Warangal (India). Regional Engineering Coll.
R. Raghavendran, and P. Javarami Reddy.
Nordic Hydrology, Vol. 6, No. 1, p 14-27, 1975. 10 fig, 2 tab, 15 ref.

Descriptors: *Synthetic hydrology, *Hydrologic data, *Runoff, *Parametric hydrology, Streamflow, Model studies, Analytical techniques, Simulation analysis, Basins, Watersheds(Basins).
Identifiers: Basin response function, Inadequate data, *Hydrological analysis, Developing region, *India, Correlated basin characteristics, Discretized basin response.

The study focused on the problem of developing a basin response function with inadequate data. The case of a catchment with some measurements of output and with input data either totally absent or unemployable was specifically taken for analysis. A method proposed earlier was extended to natural catchments from 25 sq mi to 750 sq mi. It was shown that the synthesis is subjected to uncertainties and errors when the method is applied to larger catchments, though reasonably good results are obtained for smaller catchments. An alternate method applicable for all size of catchments, assuming that linearity and time are invariable and that the parameters of the model are correlated with catchment characteristics, was suggested. (Morris - ISWS)
W76-06675

RAPID RECHARGE IN A LIMESTONE AQUIFER,
Birmingham Univ.,(England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-06685

THE STREAM AND ITS VALLEY,
H. B. N. Hynes.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 1-15, 1975. 4 fig., 2 tab., 72 ref.

Descriptors: *Ecosystems, *Running waters, *Watersheds(Basins), Lotic environments, Water sources, Hydrology, Transpiration, Organic matter, Litter, Vegetation, Precipitation(Atmospheric), Ions, Nutrients, Geochemistry, Productivity, Fulvic acids, Biodegradation, Leachate, Detritus.

The ecological concept of a stream and its watershed is substantiated by the latest scientific research and an overview of the interrelations between the valley and the lotic environment is presented. Among the concepts discussed is that the stream derives most of its energy from the uplands; that the source of organic matter is only indirectly dependent on vegetation litterfall, and its availability to benthic invertebrates and the biodegradation process depend on the vegetation type; and that the biotic energy that derives the stream communities begins in the form of dead material. There is evidence that decaying litter, or probably it biodegradation, take up a great deal of ionic nitrogen from the water and convert it to protein. The various inputs, sources, and transformations of organic matter are delineated. The sources of water in streams are not as generally supposed overland flow, but rather it is the soil of the valley which yields water over extend periods of time. Recent research propounds that transpiration can control stream discharge even during the non-growing season. The origin of nutrients and movement through the ecosystem, the reactions between ions and humic and fulvic acids, the temperature and climatic differences and how they affect productivity are also discussed. (Auen-Wisconsin)
W76-06722

2B. Precipitation

THE INTERPRETATION OF THE CRYSTALLINE AND AIR BUBBLE STRUCTURES OF HAIL STONES,
Western Australia Univ., Nedlands. Dept. of Physics.
W. C. Macklin, J. N. Carras, and P. J. Rye.
Quarterly Journal of the Royal Meteorological Society, Vol. 102, No. 431, p 25-44, January 1976. 13 fig, 3 tab, 32 ref.

Descriptors: *Hail, *Cloud physics, Crystals, Bubbles, Ice, Analysis, Thunderstorms, Temperature, Meteorology.
Identifiers: *Hailstones, *Hailstone growth, Updrafts.

It is now possible to ascertain the growth histories of hailstones of approximately spherical symmetry from studies of their internal structure. Six large hailstones 4 to 6.5 cm maximum dimension, two from each of three severe storms, were analyzed. The orientation distributions and sizes of the crystals in the hailstone layers indicated that most of the growth of the hailstones took place at ambient temperatures between about -20 and -25 C, i.e., between 2.7 and 3.7 km above the freezing level. The air bubble concentrations and size distributions showed that all the hailstones grew with surface temperatures ranging from -1C for the clear layers to about -11 C for the opaque layers comprised of very small crystals. On the assumption that the median volume radius of the cloud droplet distribution was 10 micrometers, the growth of most of the hailstones took place in liquid water concentrations of about the adiabatic values. However, fluctuations in the liquid water concentration of up to some 30% were required to explain the observed air bubble and crystal structures. The fact that the hailstones grew largely between the -20 and -25 C levels indicated that they were balanced in the updraft for most of their history. (Sims-ISWS)
W76-06167

PRODUCTION OF SECONDARY ICE PARTICLES DURING THE GROWTH OF GRAUPEL BY RIMING,
Commonwealth Scientific and Industrial Research Organization, Epping (Australia), Div. of Cloud Physics.
S. C. Mossop.
Quarterly Journal of the Royal Meteorological Society, Vol. 102, No. 431, p 45-57, January 1976. 8 fig, 1 tab, 20 ref.

Descriptors: *Cloud physics, Graupel, *Rime, Laboratory tests, Particle size, Ice, Crystals, Drops(Fluids), Raindrops, Temperature, Meteorology.
Identifiers: *Ice particles, *Graupel growth, Cloud chamber, Drop size spectrum, Collection efficiency.

Experiments indicated that secondary ice crystals are produced when rime grows in a supercooled cloud containing drops greater than or equal to 24 micrometer in diameter. This occurs between temperatures of -3 and -8 C, the production rate being greatest at -5 C. These temperatures are constant to about + or -0.5 deg C for velocities of the riming body ranging from 1.4 to 3.0 m/s. On the average one ice splinter is thrown off for every 250 drops of diameter greater than or equal to 24 micrometer accreted, at cloud temperature -5 C, and this value does not change much with target velocity. Various possible splintering mechanisms were discussed. (Sims-ISWS)
W76-06168

NITROGEN AND SULFUR CONTENT AND PH OF PRECIPITATION IN IOWA,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W76-06208

DROUGHT AND AGRICULTURE,
World Meteorological Organization, Geneva. (Switzerland).
C. E. Hounam, J. J. Burgos, M. S. Kalik, W. C. Palmer, and J. Rodda.
Technical Note No. 138, WMO-No. 392, 1975. 127 p, 16 fig, 22 tab, 370 ref, 2 append.

Descriptors: *Droughts, *Arid lands, *Agriculture, *Meteorology, *Analytical techniques, *Land management, Water balance, Water requirements, Bibliographies, Crop response, Drought resistance, Moisture stress, Plant physiology, Weather modification, Precipitation(Atmospheric), Plant growth, Air temperature, Humidity, Soil moisture, Pest control, Diseases, Livestock.

The many meteorological facets of drought are discussed including its definition and early recognition, its effect on plants, animals, and diseases, as well as its amelioration and methods for surviving under its influence. Definitions of drought are examined according to whether they are based on rainfall only, on combinations of rainfall with temperature, humidity, wind or evaporation, on soil moisture, or on plant condition. Special attention is given to various interpretations of the water-balance equation such as the Palmer model. Agricultural practices under drought conditions are discussed including the drought resistance of plants and seeds, the use of fallow as a management technique under dry conditions, the danger of erosion of drought-affected soils, and the effects of drought on pastures and livestock. Water requirements under drought conditions are also described, and it is shown that management practices and hydrologic structures can be used to lessen the impact of drought. Although drought is generally detrimental to agriculture, it may greatly reduce economic losses from some pests and diseases. Certain agricultural practices such as wind barriers, fallowing, weather modification, evaporation suppression, and cloud seeding can influence meteorological conditions in the plant/soil environment, and may be used to advantage under drought conditions. Application of standard statistical techniques which have already been used with some success in drought studies is discussed, and some examples are given. (Robinett-Arizona)
W76-06265

THE BLACK HILLS (SOUTH DAKOTA) FLOOD OF JUNE 1972: IMPACTS AND IMPLICATIONS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2E.
W76-06360

SODIUM, POTASSIUM, CALCIUM AND MAGNESIUM CONTENT OF NORTHWEST ARKANSAS RAIN WATER IN 1973,
Arkansas Univ., Fayetteville. Dept. of Geology.
G. H. Wagner, and R. W. Holloway.
Journal of Applied Meteorology, Vol. 14, No. 4, p 578-584, June 1975. 9 fig, 5 tab, 8 ref. OWRT A-025-ARK(4).

Descriptors: *Rain water, *Chemistry of precipitation, *Arkansas, Chemistry, Rainfall, Precipitation(Atmospheric), Sodium, Potassium, Calcium, Magnesium, On-site data collections, Sampling, Meteorology.

Individual rains falling on Fayetteville, Arkansas, in 1973 were analyzed for sodium, potassium, calcium, and magnesium. Compared to a drier year, 1955-1956, the average concentrations of these elements were lower in 1973 but the fluxes higher, except calcium. Each element had a peak flux in the spring and fall, corresponding to the peaks in the amount of rainfall. Calcium concentration relative to the other elements was uniquely high during late winter and early fall suggesting more wind dependence for calcium. The elemental ratios were near those for crustal rocks, not seawater. The monthly fluxes of sodium, potassium, and magnesium were nearly constant with increasing rainfall up to six inches per month, then they increased more steeply. Calcium monthly flux increased linearly with increasing rainfall. Extrapolation of the monthly flux to zero rainfall gives a measure of the dry fallout contributed to the fluxes obtained with open collectors. Dry fallout and wet fallout (rain) were about equal. (Sims-ISWS)
W76-06379

A COMPARISON OF THE RESPONSES OF IDENTICAL CUP ANEMOMETERS MOUNTED ON A SPAR AND A TOROID BUOY,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 7B.
W76-06392

CHANGES IN CLIMATE AND ESTIMATED EVAPORATION ACROSS A LARGE IRRIGATED AREA IN IDAHO,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W76-06406

PHYSICAL AND CLIMATIC CHARACTERISTICS ALONG KANSAS STREAMS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W76-06450

FACTORS ALTERING THE MICROCLIMATE IN CARLSBAD CAVERNS, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2D.
W76-06452

CASCADE ATMOSPHERIC WATER RESOURCES PROGRAM, VOLUME 3,
Washington State Dept. of Ecology, Olympia.
P. V. Hobbs, L. F. Radke, R. R. Weiss, D. G. Atkinson, and J. D. Locatelli.
Report No. VIII, May 1, 1975, 18 p. 14-06-D-6999

Descriptors: *Artificial seeding, Mountains, Cyclonic storms, Orographic clouds, Snowfall, *Weather modification, *Washington, *Cloud seeding, Precipitation(Atmospheric).
Identifiers: *Cascade Mountains(Wash).

Studies were carried out during 1972-73 of winter cyclonic storms, orographic clouds and precipitation over the Cascade Mountains of Washington State and their modifications by artificial cloud seeding. Summaries of the principal accomplishments and conclusions arrived at in the 3-year (1970-73) study are also presented. (See also W76-06600 and W76-06601) (Bureau of Reclamation)
W76-06602

DETERMINATION OF R-Z RELATIONSHIPS FOR WEATHER RADAR USING COMPUTER OPTIMIZATION TECHNIQUES,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
P. L. Smith, Jr., D. E. Cain, A. S. Dennis, and J. R. Miller, Jr.
Report 75-3, April 1975. 14-06-D-6660

Descriptors: *Cloud seeding, *Computer models, *Optimization, Hail, Hydrology, Precipitation, Radar, Reflectivity, Rainfall, *Weather modification, *North Dakota, Data collections.
Identifiers: R-Z relationship.

Quantitative radar data were collected from a 10-cm radar data set in western North Dakota during the summer of 1972 in connection with a randomized pilot project of cloud seeding. The radar data were recorded on magnetic tape for subsequent computer reduction and analysis. The computed radar reflectivity factors have been compared with rain gage observations collected by a network of 22 recording rain gages to obtain a relationship between hourly rainfall accumulation and the observations of the radar reflectivity factor Z. The relationship was obtained by applying a computer optimization technique resulting in the formula $Z = 155R1.88$. Comparison of point and area rainfall estimates obtained by applying this formula to estimates based on a network of 80 conventional rain gages in the area leads to the following conclusions: (1) The absolute radar calibration was maintained to within +1 dB during the summer. (2) With such accurate calibration, radar can lead to estimates of areal rainfall over the season within 10% to 15% of the rain gage estimates even using a standard R-Z relationship. (3) Some further improvement can be obtained by using an optimized R-Z relationship appropriate to the area, such that very close agreement can be obtained in terms of total rainfall accumulation over a season. (4) For operational measurement of areal rainfall by radar, corrections for evaporation and other meteorological variables will be necessary. (Bureau of Reclamation)
W76-06604

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, Colo.
J. H. Wagner.
Report FR-807-40, February 11, 1975. 14-06-D-7551

Descriptors: *Data collections, *Precipitation gages, *Precipitation(Atmospheric), Satellites(Artificial), Telemetry, Digital systems, Hydrometeorological station, *Remote sensing, *Networks.
Identifiers: Remote data stations, ERTS.

Two techniques for automatic collection of data from remote precipitation gages are described. Both techniques utilize a digital precipitation gage developed as a part of this program. The ERTS-RAIN concept is designed for a network of gages operating within a 12 mile radius of an ERTS Data Central. The Airborne-RAIN concept is designed for data collection from a network of gages operating over an area of several thousand square miles. Experimental systems were developed and tested in order to demonstrate the feasibility of both concepts. Recommendations for implementation of prototype networks for evaluating the operational aspects of the network are included. (Bureau of Reclamation)
W76-06606

EVALUATION OF AIRBORNE RAINDROP SIZE-DISTRIBUTIONS MEASUREMENTS FOR IMPROVING RADAR RAINFALL ESTIMATES,
Meteorology Research, Inc., Altadena, Calif.
T. B. Smith, D. T. Takeuchi, R. L. Peace, and S. M. Howard.
(1975), 407 p. 14-06-D-7536

Descriptors: *Weather modification, Equipment, Raindrops, Measuring instruments, Rain gages, Spectometers, Rainfall intensity, *Oklahoma, *Instrumentation, *Networks, Estimating.
Identifiers: Raindrop spectometers, Washita River watershed(Okla).

In May of 1974, an experiment was performed to evaluate the potential contribution of airborne measurements and/or surface raingages, for improving the accuracy and reliability of radar measurements of rainfall for evaluation of weather modification experiments. The aircraft was equipped with a PMS (Knollenberg) Precipitation Spectrometer Probe, a Metrodata Rain Rate Meter, and an MRI Hydrometeor Sampler for measurements of raindrop size-distributions. The principal radar used was the WSR-57 radar located at the National Severe Storms Laboratory in Norman, Okla. The raingages were those in the Agriculture Research Service Washita River watershed raingage network located southwest of Norman. The accuracy of the airborne measurements was evaluated by comparing the derived reflectivity values with the WSR-57 measurements and by comparing the computed rainfall intensity values with the surface raingage readings. (Bureau of Reclamation)
W76-06608

OPTIMAL SAMPLING AND OBJECTIVE ANALYSIS,
Eddy (Amos), Inc., Norman, Okla.
A. Eddy, and J. Brady.
June 27, 1975, 70 p. 14-060-D-7633

Descriptors: *Computer programs, *Rainfall, *Data processing, Climatic data, Optimization, Sampling, Instrumentation, *Model studies.
Identifiers: *Data analysis(Rainfall).

Described are three main projects, each of which centered around providing tested computer programs to the AWRM program of the Bureau of Reclamation operational on the Denver CYBER 70 computer system. Tests were conducted using Illinois State Water Survey rainfall data. (1) Optimal rainfall accumulation time and station density concepts were derived under decision constraints and observation sets input by the user. (2) Optimal interpolation objective analysis routines were implemented. These use either modelled signal and noise covariance functions or data derived covariance functions at the option of the user. (3) Sensor placement routines were provided and tested using as input simply configured shower rainfall patterns the descriptions of which are input by the user in meteorologically familiar erms. (4) A proposed sampling and analysis model is offered. This would effect an optimal combined use of radar reflectivities and surface rain gage measurements. (Bureau of Reclamation).
W76-06609

CHEMICAL/BIOLOGICAL RELATIONSHIPS RELEVANT TO ECOLOGICAL EFFECTS OF ACID RAINFALL,
National Ecological Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5A.
W76-06650

USE OF RADAR INFORMATION IN DETERMINING FLASH FLOOD POTENTIAL,
National Weather Service, Garden City, N.Y. Eastern Region.
For primary bibliographic entry see Field 4A.
W76-06653

ICE PARTICLE MULTIPLICATION IN CUMULUS CLOUDS,
Manchester Univ. (England). Dept. of Mathematics.
R. F. Chisnell, and J. Latham.
Quarterly Journal of the Royal Meteorological Society, Vol. 102, No. 431, p 133-156, January 1976. 1 fig, 6 tab, 17 ref, 1 append.

Descriptors: *Model studies, *Cloud physics, *Ice, *Rime, Mathematical models, Drops(Fluids), Raindrops, Particle size, Crystals, Precipitation(Atmospheric), Freezing, Graupel, Stochastic processes, Mathematics, Meteorology.
Identifiers: *Ice particles, Ice splinters, Graupel growth, Drop growth.

Ice particle multiplication in shallow supercooled clouds was described by a stochastic process, which depends on collisions between ice particles and supercooled water droplets and drops. The multiplication is a consequence of the riming and drop splintering processes, or possibly just one of them. In the riming process, a large ice particle collects water droplets which eject splinters on freezing. In the drop splintering process, a supercooled drop which collides with a splinter, freezes and may eject splinters. The probability of collision between an ice splinter and a water drop was estimated by considering their fall velocities and assuming a collection efficiency of unity. As a consequence of the small and large water drop division, the ice splinters are also divided; small ice splinters collide with all water drops, but large splinters having fall velocities comparable with those of small water drops collide only with large water drops. The growth of all ice particles by diffusion of water vapor or accretion of water droplets is taken into account, splinters not captured by water drops grow to rimer status after an appropriate time. Rimers are removed from the system at the time they fall through the OC isotherm. A rimer may also be formed as a result of the freezing of a large supercooled water drop, following its collision with an ice splinter. (Sims-ISWS)
W76-06678

URBAN EFFECTS ON THE DISTRIBUTION OF HEAVY CONVECTIVE RAINFALL,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4C.
W76-06680

AGRICULTURAL DROUGHT OF 1972 KHARIF SEASON,
Meteorological Office, Poona (India).
C. J. George, and K. S. Ramasastri.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 26, No. 1, p 89-96, January 1975. 8 fig, 5 ref.

Descriptors: *Droughts, *Water balance, *Indian Ocean, Climates, Networks, Crop response, Recession curves, Monsoons, Rainfall, Storms, Regional analysis.
Identifiers: *Agricultural droughts, *Kharif season, *India, Aridity index, Crop reports, Drought areas, Southwest monsoons.

The agricultural drought of the 1972 Kharif season was studied by computing weekly water balance of a selected network of stations. Weekly aridity index values above the climatic aridity index was used to identify drought incidence. The study showed that a prolonged drought spell, abating only for short periods, prevailed in the season over large areas of Madhya Maharashtra, Marathwada, Gujaret, Rajasthan, Interior Mysore and Andhra Pradesh. The findings were substantiated by reports in newspapers and crop reports of that period. (Roberts-ISWS)
W76-06681

THE MEASUREMENT AND RECORDING OF RAINFALL INTENSITIES,
J. Drabbe.
Weather, Vol. 30, No. 8, p242-247, August 1975. 3 fig.

Descriptors: *Rain gages, *Precipitation gages, *Instrumentation, Equipment, Measurement, Rainfall, Precipitation(Atmospheric), Precipitation intensity, Rainfall intensity, Meteorology.

Rainfall intensity research is useful in recording average as well as phenomenal falls, and correlating them with damage done to roads, pastures, and the general environment. To give a more detailed picture of the intensities it is better to measure the rainfall in small increments of, say, tenths of a millimeter rather than in large increments of, say, a millimeter. With these aims in mind, a completely new type of gage was designed, and built. As small amounts are difficult to measure on a bucket-type instrument, it was decided to pass the water into measuring tubes where they are automatically discharged when the meniscus touches a sensitive probe situated in the top of the tube. Two tubes are then required so as not to impede the flow of water through the system. While one tube is being filled up to its mark, the other is either discharging or has been emptied. The maximum handling capacity of the gage is 200 millimeters of rain per hour when it is measuring in tenths of one millimeter. While greater falls than 200 millimeters per hour are possible in some parts of the world, prolonged falls such as this are rare. (Sims - ISWS)
W76-06692

PRECIPITATION IN VALLEYS,
R. W. Longley.
Weather, Vol. 30, No. 9, p 294-300, September 1975. 5 fig, 5 tab, 3 ref.

Descriptors: *Rainfall disposition, *Topography, *Valleys, *Canada, Precipitation(Atmospheric), Orography, Distribution patterns, Climatology, Meteorology.

The effects of hills and mountains on the spatial distribution of rainfall have long been studied, but very little has been written on the effect of a valley on the distribution of rainfall. From the monthly records the monthly totals were abstracted for stations in the prairie provinces of Canada. Ratios were calculated for the precipitation at valley stations as compared to other nearby stations on the plains above the valley. The average ratio was 1.17 for all months and stations c ombined. For all months, the valley precipitation was always less. The ratio was minimum in July at 1.12, and maximum in December when the ratio was 1.25. (Sims - ISWS)
W76-06693

A SIMPLE RAIN-GAUGE FOR DENSE NETWORK RESEARCH,
Newport Grammar School, Essex (England).
I. J. Roper.
Weather, Vol. 30, No. 10, p329-336, October 1975. 1 fig, 2 tab, 18 ref.

Descriptors: *Rain gages, *Precipitation gages, *Instrumentation, Equipment, Rainfall, Measurement, Precipitation(Atmospheric), Winds, Correlation analysis, Regression analysis, Meteorology.

Standard Meteorological Office rain-gages are expensive, and often a cheaper acceptable substitute would be desirable, especially for dense network studies and where theft and wanton damage at sites in open agricultural land may have to be met. Such was the case when a dense network of over twenty gages was installed in the 15.4 sq km catchment of the Catchwater Drain, in East Yorkshire. As a substitute for conventional gages, plastic funnels with a 126.6 sq cm orifice (i.e. five-inch diameter), sharpened to a knife edge, were

used in conjunction with ordinary wine bottles. No attempt was made to reproduce the cylindrical shape of the Meteorological Office gage. The M.O. pattern gages have a vertical rim 11.5 cm high to stop outsplash, whereas the plastic funnels had a rim only 2.4 cm high; despite this, the latter still caught more rain. The main effect difference in design was the lower wind resistance offered by the plastic funnel gages. Although there was a variation of + or minus 4% in the daily catch, comparing the plastic gages with the standard M.O. gage, such a result could occur purely because of local chance eddies and turbulence. Thus simple plastic funnel gages would appear to offer a reliable substitute for a M.O. gage if cost represents an important consideration when deciding on the number of gages that might be used. (Sims - ISWS)
W76-06694

2C. Snow, Ice, and Frost

THE WATER FAUNA OF THE HIGH MOUNTAIN GLACIER LAKES IN THE MANDARAS VALLEY IN THE HIGH HINDU KUSH, (IN POLISH),
Jagellonian Univ., Krakow (Poland). Instytut Zoologii Systematics; and Jagellonian Univ., Krakow (Poland). Instytut Zoogeography.
For primary bibliographic entry see Field 5C.
W76-06166

MAXIMUM WATER EQUIVALENTS OF SNOW IN THE NORTHWESTERN REGIONS OF THE EUROPEAN USSR,
L. K. Vershinina, and V. N. Volchenko.
Soviet Hydrology, Selected Papers, No. 1, p 1-11, 1974. 5 fig, 6 tab, 12 ref. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 214, p 37-53, 1974.

Descriptors: *Snow, *Water equivalent, *Melt water, *Europe, Precipitation(Atmospheric), Snowfall, Snow surveys, Runoff, Runoff forecasting, Forests, Snowmelt, Snow cover, Soil moisture, Watersheds(Basins), Temporal distribution.
Identifiers: *USSR.

The water equivalent of snow accumulated over the winter is the main factor determining the magnitude of the spring flood runoff in regions deficient in moisture, since soil moisture varies little from year to year. For this reason, it is particularly important to compute the maximum water equivalents and their variations in these regions. Maps were constructed of the distribution of 22-year mean maximum water equivalent and of its variation for the field from data at 146 points. The temporal variations of maximum water equivalent were practically the same in the field and forest. This made it possible to compute the maximum water equivalent of varying probability for entire river basins, using the parameters of the distribution curves obtained for any given type of landscape, i.e., field or forest. Average snow accumulation was 10-20% higher in mixed and deciduous forests than in the field, regardless of the location of the forests in the region under study, while it was lower by 5-10% in predominantly coniferous forests because of the interception of snow by the tree crowns and its subsequent evaporation. The spacial variations of maximum water equivalent in fields and forests in the extreme west (Latvian SSR) and in the northwest (Luga River basin) were determined by the snowiness of the winter. (Sims-ISWS)
W76-06172

EXPERIMENT IN APPLYING CORRELATION ANALYSIS TO THE DESCRIPTION OF THE TEMPORAL VARIATIONS OF SNOW MELTING INTENSITY IN THE DON RIVER BASIN,
M. S. Dcleur, and V. A. Rumayntsev.
Soviet Hydrology, Selected Papers, No. 1, p 12-16, 1974. 2 fig, 2 ref. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 214, p 54-60, 1974.

Descriptors: *Snowmelt, *Snow, Melting, *Temporal distribution, *Correlation analysis, Statistical methods, Snowfall, Melt water, Thawing, Runoff, Timing.
Identifiers: *USSR, *Melting rates, *Don River Basin(USSR).

It is important to know the space-time variations of various hydrometeorological characteristics to solve some practical problems and for forecasting purposes. Of particular interest is the snow melting rate, whose behavior in time and space is usually disordered and largely random. For this reason, the variations in melting rate can be described only statistically. Results were reported of a correlation analysis of the temporal variations of the snow melting rate in the Don River basin. A fairly high time correlation between the daily snow melting rates with a shift of 1-2 days was established. The correlation functions were shown to be inhomogeneous for different years. A relation was obtained between the terms of time correlation functions and elevation. It is suggested that a discrete first-order autoregression process be used as a model of the generating process for the snow melting rate. It was found from the model of the autoregression process for the years under study that a linear forecast of the snow melting rate is unsatisfactory, even for a forecast one day in advance. (Sims-ISWS)
W76-06173

DETERMINATION OF THE DATES OF SNOW DISAPPEARANCE IN THE FOREST,
S. B. Deribizova.
Soviet Hydrology, Selected Papers, No. 1, p 17-22, 1974. 1 fig, 3 tab, 13 ref. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 214, p 61-69, 1974.

Descriptors: *Snow, *Melting, *Forests, Timing, Temperature, Water equivalent, Precipitation(Atmospheric), Snowfall, Snowmelt, Deciduous forests, Coniferous forests.
Identifiers: *USSR.

The dates of the disappearance of the main mass of snow from fields and forests in drainage basins must be known to analyze the conditions of spring flood runoff formation. This makes it possible to estimate the part played by precipitation before and after the disappearance of snow, as well as that of evaporation and other factors in the formation of flood runoff. The station network observes the disappearance of snow only in fields within the visible range of the station surroundings. For this reason, the data on snow disappearance in forests must be determined by computation. The dates of snow disappearance in forests can be reliably computed from snow melting coefficients (mm per degree of positive air temperature) that are constant for each spring and from a typical areal snow distribution curve. In mass computations, the dates of snow disappearance in forests can be determined from the date of occurence of maximum discharges for rivers with a basin area of 2-10,000 sq km that are more than 60% wooded. The computed dates of snow disappearance make it possible to analyze the conditions of spring flood runoff formation during the melting period and the snowless part of the flood. (Sims-ISWS)
W76-06174

MELTWATER LOSSES THROUGH INFILTRATION INTO PODZOLIC SOILS AND CHERNOZEMS,
For primary bibliographic entry see Field 2G.
W76-06181

MEASUREMENT OF SMALL STRAIN-RATES OVER SHORT TIME PERIODS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Glaciology Div.
G. Holdsworth.
Journal of Glaciology, Vol. 14, No. 71, p 317-324, 1975. 7fig, 3 ref.

Descriptors: *Instrumentation, *Strain measurement, *Ice, Strain, Strain gages, Glaciers, Measurement, Physical properties, Equipment, On-site investigations, Glaciology.
Identifiers: *Laser interferometers.

A laser interferometer has been used to measure small relative displacements between two reference points spaced up to 99.76 m apart and fixed in an ice surface. Strain-rates of order 10 to the minus 11th power/s can be detected easily within a 24 h period and possibly within an 8 h period. Application of this system could be extended to sea or lake ice provided the mounting posts are redesigned. The laser unit operates successfully at air temperatures below 0 C. Under enclosed conditions or in stable air without precipitation, the maximum practical distance between the interferometer and the reflector is about 100 m, with the laser output gain at the highest level. (Sims - ISWS)
W76-06184

RAPID PRODUCTION OF SINGLE CRYSTALS OF ICE,
National Physical Research Lab. Pretoria (South Africa).
D. v. d. S. Roos.
Journal of Glaciology, Vol. 14, No. 71, p 325-328, 1975. 3 fig, 8 ref.

Descriptors: *Ice, *Crystal growth, *Crystals, Technology, Laboratories, Laboratory equipment, Seeds, Glaciology.
Identifiers: *Laboratory procedures, Ice crystal growth, Seed crystals, Dendrites.

A description was given of how to grow single crystals of ice of desired orientation by applying the method of seed extraction from the melt. A single crystal of more than 1 g can be grown in less than one hour. (Sims-ISWS)
W76-06186

ORIENTATION OF SOIL STRIPES CAUSED BY NEEDLE ICE,
British Columbia Univ., Vancouver. Dept. of Geography; and British Columbia Univ., Dept. of Geological Sciences.
J. R. Mackay, and W. H. Mathews.
Journal of Glaciology, Vol. 14, No. 71, p 329-331, 1975. 1 fig, 9 ref.

Descriptors: *Ice, *Soils, Thawing, Melting, Solar radiation, Soil water, Soil moisture.
Identifiers: *Needle ice, Soil stripes.

Orientation of striping caused by needle ice has been ascribed in the past to (1) wind direction during soil freezing, and (2) azimuth of the sun during thawing. Recent evidence supported the latter concept. Needle-ice striped ground can be shown to result as a thaw phenomenon by direct observation, by controlled and natural shading which prevents stripe growth, and by experiments with a heat lamp to cause striping. (Sims-ISWS)
W76-06187

SEDIMENTS EXPOSED ON THE SURFACE OF THE ROSS ICE SHELF, ANTARCTICA,
Nebraska Univ., Lincoln. Ross Ice Shelf Project.
D. R. Gaylord, and J. D. Robertson.
Journal of Glaciology, Vol. 14, No. 71, p 332-333, 1975. 1 fig, 1 ref. NSF GV-4073X, GV-39639.

Descriptors: *Sediments, *Ice cover, *Antarctic, Glaciers, Ice, Sedimentology, Glaciology.
Identifiers: *Ross Ice Shelf(Antarctica), Ice shelves.

A highly crevassed region near a grounded ice rise on the Ross Ice Shelf, Antarctica, was investigated and found to contain poorly sorted sediments. Preliminary analysis of a 27 g sample of sediments was undertaken using megascopic, microscopic, and X-ray diffraction methods. Igneous and metamorphic rock fragments, their constituent minerals, and micro-fossils were noted in the sample. Insufficient data have been collected at this time to denote a particular source area for the sediments. (Sims-ISWS)
W76-06188

CALCULATING TEMPERATURE REGIME OF EARTH DAMS IN PERMAFROST REGIONS,
Moskovskii Inzhenerno-Stroitelnyi Institut (USSR). Dept. of Hydraulic Engineering Structures.
For primary bibliographic entry see Field 8D.
W76-06191

THE BEARING CAPACITY OF FLOATING ICE PLATES SUBJECTED TO STATIC OR QUASI-STATIC LOADS, A CRITICAL SURVEY,
Princeton Univ., N. J. Dept. of Civil and Geological Engineering.
For primary bibliographic entry see Field 8G.
W76-06192

PREVENTION AND CONTROL OF CULVERT ICING, SUMMARY REPORT ON STUDIES FY 1966-70,
Cold Regions Research and Engineering Lab., Hanover, N. H. Experimental Engineering Div.
For primary bibliographic entry see Field 8A.
W76-06193

SNOW AVALANCHE HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT.
Colorado Univ., Boulder, Inst. of Behavioral Science.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-242 980, $5.50 in paper copy, $2.25 in microfiche. Monograph NSF-RA-E-75-017, 1975. 86 p, 13 fig, 10 tab, 54 ref. NSF GI-32942.

Descriptors: *Avalanches, *Snow, *Snow management, Snowpacks, Hazards, Safety, Control, Snow cover, Snow cornice, Winter sports, Skiing, Damages, Explosions, Forests, Mountains, Construction, Structures, *Research priorities, Evaluation.

In recent years, research to find effective ways of dealing with avalanche hazards has intensified. In spite of these efforts, the risk to population and property continues to increase in harmony with the movement of population to mountain recreation areas of the western United States. With greater risk should come increasing support to research aimed at aleviating the hazard to people and property. Construction of control works is limited by the availability of suitable sites and by environmental costs. Among the various adjustments, control and protection can be undertaken with the greatest confidence that the anticipated reduction in risk will be achieved either by more reliable techniques or by more efficient application. More reliable avalanche warning would have the obvious benefits of reduced risk and loss, especially in the case of short-term warnings of potential occurrences along highways and in ski areas. If avalanche risk zones can be adequately identified, land use regulations can be created which will require that development be commensurate with the level of risk. Such regulations should lead to loss reduction in the long run; for this risk mapping is essential. (Sims- ISWS)
W76-06195

BEHAVIOUR OF OIL UNDER CANADIAN CLIMATIC CONDITIONS PART 1. OIL ON WATER UNDER ICE-FORMING CONDITIONS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5G.
W76-06366

FLOOD OF JUNE 1971 FORT NELSON AND MUSKWA RIVERS,
Department of the Environment, Vancouver (British Columbia). Inland Waters Directorate (Pacific Region); and Department of the Environment, Vancouver (British Columbia). Water Resources Branch.
For primary bibliographic entry see Field 2E.
W76-06367

RESEARCH PROJECTS IN GLACIOLOGY - 1974,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Resources Branch.
Report Series No. 36, 1974, 123 p, 17 photos, 133 ref.

Descriptors: *Glaciology, *Research facilities, *Arctic, *Hydrology, Remote sensing, Mapping, Instrumentation, Ice cover, Avalanches, Glaciers, Bibliographies, Snow cover, Cryogenics, Crystallography, Permafrost, Microwaves, Drilling, Gamma rays, Pipelines, Electrical properties, Ice jams.
Identifiers: Northwest territories, Mackenzie Valley, Ice properties, Floating ice, Ice-breaking, Glacier mapping.

The glaciological research program of the Water Resources Branch of the Department of the Environment is outlined. The objectives and organization of the group are summarized and a catalog of individual research projects is included. Project descriptions include the name of the investigator, the objectives of the research, the location of the research, the work underway, and the future program. Publications by members of the Glaciology Division are listed. (Environment Canada)
W76-06368

DETERMINATION OF SNOW DEPTH AND SNOW EXTENT FROM NOAA 2 SATELLITE VERY HIGH RESOLUTION RADIOMETER DATA,
National Environmental Satellite Service, Washington, D.C.
D. F. McGinnis, Jr., J. A. Pritchard, and D. R. Wiesnet.
Water Resources Research, Vol. 11, No. 6, p 897-902, December 1975. 6 fig, 5 ref.

Descriptors: *Satellites(Artificial), *Snow, *Snow cover, *Remote sensing, Reflectance, Regression analysis, Precipitation(Atmospheric), Snowpacks, Data processing.
Identifiers: *Snow depth, Brightness, Very high resolution radiometer.

The NOAA 2 environmental satellite and subsequent environmental satellites provide daily coverage of the earth in the visible (0.6-0.7 micrometer) and thermal (10.5-12.5 micrometer) spectral bands. The ground resolution of the very high resolution radiometer is 1 km at nadir. This improved resolution in the visible spectral band permits more detailed observations of snow features than were possible with the previous operational satellites. A visible band image from February 11, 1973, depicted the heavy snow cover in considerable detail in areas from Alabama to North Carolina. Digitized reflectance data from the study area were compared with prestorm bare ground digitized reflectance data of February 6, 1973, to examine the relation of snow reflectivity to snow depths. A regression analysis of greatest brightness versus greatest snow depth for 201 data pairs produced a power correlation coefficient of 0.86. Reflectance values from snow deeper than 30 cm tended to be uniformly high; values from snow less than 30 cm tended to increase rapidly as snow depth increased. (Jones - ISWS)
W76-06383

METHOD FOR COMPUTING EVAPORATION DURING THE SNOW MELTING AND FLOOD PERIOD IN THE CENTRAL CHERNOZEM REGIONS OF THE EUROPEAN USSR,
For primary bibliographic entry see Field 2D.
W76-06407

A METHOD FOR ESTIMATING SNOWFALL AMOUNTS,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
R. L. Beschta.
Water Resources Bulletin, Vol. 11, No. 6, p 1209-1219, December 1975. 5 fig, 3 tab, 17 ref.

Descriptors: *Snowfall, *Estimating, *Snow, *Statistical methods, Temperature, Precipitation(Atmospheric), Climatic data, Regression analysis, Snow cover, Geomorphology.
Identifiers: *Snowfall index, Snow density, Snow load, Snow accumulation, Scatter diagrams.

Long-term climatic data from National Weather Service stations in six areas of the United States were utilized to develop regression equations relating a 'snowfall index' parameter and air temperature. Nearly 200 stations, representing a wide range in physiographic and climatic conditions, were selected for analysis. Snowfall index was defined as the ratio of snowfall depth to precipitation. Using annual data, regression analysis indicated snowfall index to be significantly (alpha=0.01) related to temperature for five of the six areas studied. Differences between equations were attributed to the effects of precipitation and temperature during non-snowfall periods. Mean monthly data were also considered and significant equations (alpha=0.01), representing a family of similarly shaped curves, were obtained. The illustrated equations can be used for estimating mean monthly and annual snowfall amounts for stations having only temperature and precipitation measurements. (Jones-ISWS)
W76-06408

PRELIMINARY HYDROGRAPHY AND HISTORIC TERMINAL CHANGES OF COLUMBIA GLACIER, ALASKA,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W76-06449

DEVELOPMENT OF METHODOLOGY FOR EVALUATION AND PREDICTION OF AVALANCHE HAZARD IN THE SAN JUAN MOUNTAIN AREA OF SOUTHWESTERN COLORADO,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
R. L. Armstrong, E. R. LaChapelle, M. J. Bovis, and J. D. Ives.
Report INSTAAR-14-06-7155-3, December 1974, 141 p. 14-06-D-7155

Descriptors: *Avalanches, *Forecasting, Snow, Snowpacks, Precipitation(Atmospheric), Hazards, Precipitation rate, Monitoring, *Colorado, *Methodology.
Identifiers: Snow formation, *San Juan Mountains(Colo).

Avalanche initiation is under study by analyzing the complex relationships among terrain, climate, and snow stratigraphy. Air and snowpack temperatures, wind speed and direction, precipitation rate and amount, snow settlement rate, net all-wave radiation at the snow surface, and snow density and water equivalent values are measured at the prime study site at Red Mountain Pass (3400 m). Climatological data are also collected routinely in Silverton (2830 m) and at the Rainbow site (3490 m) adjacent to the starting zones of the Brooklyns avalanche paths. Avalanche events are monitored by direct observation and by trip wires on selected paths. During the third winter, emphasis was placed on the development of the snow stratigraphy; abundant snow pit data were acquired from standard level snow study sites, from test slopes similar to avalanche release zones, and from avalanche fracture lines. Avalanche hazard forecasts based on weather and snowpack conditions were made daily. In addition, work began on a statistical model to forecast avalanche occurrence. (Bureau of Reclamation)
W76-06605

HYDROLOGICAL FORECASTING PRACTICES.
World Meteorological Organization, Geneva (Switzerland). Working Group on Hydrological Forecasting.
For primary bibliographic entry see Field 2A.
W76-06633

SEASONAL STREAMFLOW ESTIMATION EMPLOYING SATELLITE SNOWCOVER OBSERVATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 4A.
W76-06638

OPERATIONAL ICE FORECAST FOR THE LITTLE RAPIDS CUT,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
J. C. Rogers, B. DeWitt, and D. Dixon.
Technical memo. ERL GLERL-4, GLERL Contribution No. 46, November 1975. 17 p, 2 fig, 3 tab, 2 ref, 4 append.

Descriptors: *Ice, *Ice cover, *Climatology, Weather forecasting, Future planning(Projected), Meteorology, Hydrology, Meteorological data, Hydrologic data, Air temperature, Great Lakes Region, *Michigan, Forecasting.
Identifiers: *Ice forecast, *Forecast procedures, Little Rapids Cut(Mich), St. Mary's River(Mich).

An operational 5-day forecast procedure is presented for predicting the initial date of ice-related problems at the Little Rapids Cut and the continuing degree of difficulty the Sugar Island Ferry would experience in crossing the St. Marys River at that point. The forecast procedures were developed by use of meteorological and hydrological data, aerial photographs of ice cover, and time lapse films of the motion of jammed ice toward the Sugar Island ferry crossing. Ice problems had generally begun within 10 days after the water temperature in the river had reached 32F. Once ice problems began, the degree of difficulty in crossing the river, expressed in three probability categories, was forecast daily, based upon air temperatures, upstream ice cover, and shipping activity. Results of the operational-experimental forecast of the onset date of problems during the 1974-75 winter are presented. With the continuation of shipping and accumulation of over 850 freezing degree-days, the Sugar Island ferry was often not able to cross the river without ice-breaker assistance. (NOAA)
W76-06658

DEVELOPMENT OF SNOW WATER EQUIVALENT SURVEY METHODS USING AIRBORNE GAMMA MEASUREMENTS,
EG and G, Inc., Las Vegas, Nev.
A. Fritzsche, and C. Juniper.
Report No. EGG-1183-1677, 24 p, 3 fig, 2 tab, Nov 1975. EGG-1183-1677, No. E(29-11-1183).

Descriptors: *Surveys, *Snow surveys, *Hydrologic data, *Measurements, Hydrology, Snow, Snowmelt, Water equivalent, Soil moisture, *Remote sensing.
Identifiers: *Gamma measurements, *Airborne gamma measurements, Snow water, Snow water equivalent, Soil moisture surveys.

A summary is presented of the progress made during the period March 1975 through September 1975 on EG and G's support of NOAA for development of airborne techniques for measurement of the water equivalent of snow and soil moisture. The work included a series of snow and soil moisture surveys and development of a new detector and data acquisition system. Plans for the immediate future are reviewed. In addition, suggestions for other future work are discussed and recommendations made. (NOAA)
W76-06659

SNOW WATER EQUIVALENT SURVEYS OF THE SOURIS RIVER BASIN,
EG and G, Inc., Las Vegas, Nev.
A. E. Fritzsche, and E. L. Feimster.
Rpt. No. EGG-1183-1668, November 1975. 44 p, 1 fig, 10 tab, 8 ref, 4 append. E(29-11-1183),

Descriptors: *Water measurement, *Snow, *Snow surveys, *Water equivalent, Snowmelt, Hydrologic data, Hydrology, Canada, North Dakota.
Identifiers: Snow water, Snow water equivalent, *Snow water equivalent surveys, Gamma fluence, Bare ground surveys, *Souris River Basin(N Dak-Can).

Three airborne surveys, employing the measurement of the natural terrestrial gamma radiation to determine the water equivalent of snow cover, were conducted over the Souris River Basin in Saskatchewan, Canada, and North Dakota, in the fall and winter of 1974-75. This airborne survey method used the attenuation of the natural terrestrial gamma fluence rate (flux) to measure the water equivalent of snow on the earth's surface. Twenty-three survey lines (12 in North Dakota and 11 in Saskatchewan) were chosen as adequate coverage of the Souris River Basin. Snow water equivalent results are reported for each of the 23 sub-basins. (NOAA)
W76-06665

ICE PARTICLE MULTIPLICATION IN CUMULUS CLOUDS,
Manchester Univ. (England). Dept. of Mathematics.
For primary bibliographic entry see Field 2B.
W76-06678

2D. Evaporation and Transpiration

EFFECTS OF WATER STRESS ON LEAF RESPIRATION, TRANSPIRATION RATES IN THE DARK AND CUTICULAR RESISTANCE TO WATER VAPOR DIFFUSION OF TWO CORN INBREDS,
Laval Univ., Dept. of Phytotechnie, Quebec.
P. A. Dube, K. R. Stevenson, G. W. Thurtell, and R. B. Hunter.
Canadian Journal of Plant Science, Vol. 55, p 565-572, April, 1975. 4 fig, 1 tab, 24 ref.

Descriptors: *Moisture stress, *Plant physiology, *Transpiration, *Respiration, *Corn(Field), Plant growth, Drought tolerence, Moisture tension, Osmotic pressure, Water requirements, Plant tissues, Leaves, Stomata, Water vapor, Crop production.
Identifiers: *Cuticular resistance, Water vapor diffusion, Zea mays L. Q188, Zea mays L. DR1, Dark transpiration.

Growth chamber studies on 2 lines of corn (Zea mays L.), a wilting inbred line (Q188) and an inbred line known to have at least some heat and drought tolerance (DR1), indicated differences in dark transpiration and the magnitude of cuticular resistances to water vapor diffusion. Q188 had greater dark transpiration than DR1 and both showed decreased transpiration as leaf water potentials decreased. Cuticular resistance to water vapor diffusion was initially higher in DR1 and increased at a faster rate than in Q188 as the drying cycle progressed. Incomplete recovery in leaf water potential was observed in both lines upon watering after severe desiccation. No differences were found in leaf respiration rates between the inbreds. (Robinett-Arizona)
W76-06266

WATER USE, ENERGY BALANCE AND GROWTH OF MAIZE AT SAMARU, NORTHERN NIGERIA,
Institute for Agricultural Research, Zaria (Nigeria).
For primary bibliographic entry see Field 3F.
W76-06298

CHANGES IN CLIMATE AND ESTIMATED EVAPORATION ACROSS A LARGE IRRIGATED AREA IN IDAHO,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
R. D. Burman, J. L. Wright, and M. E. Jensen.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 6, p 1089-1093, November-December 1975. 7 fig, 3 tab, 16 ref.

Descriptors: *Evaporation, *Irrigation, *Climates, *Idaho, Estimating, Advection, Crops, Irrigated land, Evapotranspiration, Temperature, Precipitation(Atmospheric), Sagebrush, Winds, Humidity, Diurnal, Vapor pressure, Wind velocity, Climatology.
Identifiers: *Climatic change, *Estimated evaporation, Irrigated crops, Climatological study, Hygrothermographs, Steppe climate.

Ground level climatic measurements were taken along a 50 km transect going from dry sagebrush land into the center of a large irrigated area in southern Idaho. Measurements in May, when the desert area was dry, indicated that climatic changes across the transect were minimal. In August, when the desert was obviously very dry, air temperatures decreased, vapor pressure increased, and windspeed was reduced about 40% within the irrigated area. The results demonstrated that any weather service agency or group must consider the distance from dry surroundings when selecting sites that are to be representative of climatic conditions over irrigated fields. (Roberts-ISWS)
W76-06406

METHOD FOR COMPUTING EVAPORATION DURING THE SNOW MELTING AND FLOOD PERIOD IN THE CENTRAL CHERNOZEM REGIONS OF THE EUROPEAN USSR,
A. N. Postnikov.
Soviet Hydrology, Selected Papers, No. 1, p 23-31, 1974. 2 fig, 9 tab, 8 ref. Translated from State Hydrologic Institute (Trudy GGI), No. 214, p 70-83, 1974.

Descriptors: *Evaporation, *Snowmelt, Soils, Flood peak, Moisture, Spring, Evaporimeters, Precipitation(Atmospheric), Soil horizons, Probability, Radiation, Grasslands, Forests.
Identifiers: *Central Chernozem regions, *Flood period, *European USSR, *USSR, Forest-steppe, Forest zone, Spring flood.

Evaporation is fairly high during the spring flood period in the forest-steppe and forest zones of European USSR. It amounts to 10-70% of the sum of water equivalent and precipitation in certain years. Evaporation from the surface of drainage basins must be taken into account in hydrologic budget studies and in the analysis and computation of spring flood runoff. Since it is difficult to measure evaporation directly in spring, and at only a few limited places, it becomes necessary to develop simple methods for computing evaporation from meteorological data. An attempt was made to establish a relation between evaporation during the spring flood period and the total air moisture deficit over this period. Observations were made with evaporimeters evenly distributed over the Don River basin. They were filled when snow started melting, weighed every 5 days, and refilled every 10 days. It was concluded that during the spring flood period, the upper soil layers had a moisture content close to or exceeding minimum moisture capacity after the disappearance of snow. It was also concluded that evaporation from basin surfaces during snow melting may be computed by the formula: E = 0.44 Sigma d, where d is the daily moisture deficit in mb. During the remainder of the spring flood period the formula is: E = 1.1(Sigma d) 0.82. (Roberts-ISWS)
W76-06407

FACTORS ALTERING THE MICROCLIMATE IN CARLSBAD CAVERNS, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
J. S. McLean.
Open-file report 76-171, February 1976. 56 p, 33 fig, 4 tab, 10 ref.

Descriptors: *Evaporation, *Caves, *Karst Hydrology, *New Mexico, *Data collections, Monitoring, Temperature, Humidity, Carbon dioxide, Air, Evaporation pans, Water levels, Underground streams, Lighting, Least squares method, Equations, Evaluation.
Identifiers: *Carlsbad Caverns(N Mex).

In 1968, the U.S. Geological Survey began a cooperative program with the National Park Service to study the microclimate in Carlsbad Caverns, N. Mex., to determine ways of reducing excess evaporation from the cave pools and restoring the cave microclimate to more nearly natural conditions. Revolving doors installed during the summer of 1972 at the bottom of the elevator shaft reduced airflow up the elevator shaft which in turn reduced the net evaporation in the cave at least 10 percent. Evaporation pans near the elevator shaft showed a 34 percent average decrease in the annual evaporation rate. Annual evaporation at most locations remote from the elevator shaft increased an average of 23 percent. It is assumed that the increase in evaporation in remote areas of the cave is caused by the heat output resulting from energy consumption for lighting. An analysis using least-squares equations indicated that part of the evaporation at four of the nine evaporatiou pans can be correlated with energy consumption and may represent an average of 23 percent of total evaporation at these locations. (Woodard-USGS)
W76-06452

USING EVAPORATION VALUES FROM EVAPORATION PANS TO ESTIMATE THE WATER CONSUMPTION OF AGRICULTURAL PLANTS AS THE BASIS OF SPRINKLER IRRIGATION CONTROL, (IN GERMAN),
W. Schaefer, and R. Koitzsch.
Arch Ackerpflanzenbau Bodenkd 19(5); p 365-374, 1975.

Descriptors: *Evaporation, *Evapotranspiration, Water consumption, Sprinkler irrigation, Wheat, Potatoes, Sugar beets, Corn(Field), Transpiration.

Evaporation of a free water surface and evapotranspiration of a plant stand sufficiently supplied with water are governed by similar physical processes. The values of potential evaporation (evaporation in pans) may be used for controlling sprinkler irrigation. During the dry seasons of 1971 and 1973, early potatoes, green maize, spring wheat and sugar beet produced the same yield increase with sprinkling control on the basis of pan evaporation values and with control by the estimation method according to Klatt.--Copyright 1975, Biological Abstracts, Inc.
W76-06729

ESTIMATION OF THE TOTAL EVAPORATION OF EXPERIMENTAL OBJECTS IN CLIMATIC CHAMBERS, (IN BULGARIAN),
Academy of Agricultural Sciences, Sofia (Bulgaria). Central Lab. for Agrophysical Investigations.
M. Petkova-Kilifarska.
Fiziol Rast (Sofia) 1 (2), p 93-102, 1974.

Descriptors: *Evaporation, *Moisture, Energy, Transpiration, Estimating, *Heat balance, *Leaves.
Identifiers: Climatic chambers, Evaporation.

To evaluate the heat and moisture exchange between plant leaves and the surrounding atmosphere, the dependences which are applied for the theory of heat and mass exchange were used. Methods are discussed for estimating the energy used in the total transpiration of the experimental objects in climatic chambers. Data obtained in this manner later make possible a more correct estimation of the total heat balance of these chambers.--Copyright 1975, Biological Abstracts, Inc.
W76-06766

PHYSICAL STUDY OF EVAPOTRANSPIRATION IN NATURAL CONDITIONS: I. ENERGY BALANCE OF NATURAL SURFACES AND EVAPORATION, (IN FRENCH),
Institut National de la Recherche Agronomique, Versailles (France). Station Bioclimatology.
A. Perrier.
Ann Agron (Paris) 25(1); p 1-18, 1975.

Descriptors: *Evapotranspiration, Energy budgets, *Evaporation, Surfaces.

According to the classical relationships describing transfer and energy balance, actual evaporation and potential evaporation are analyzed functions of 4 kinds of parameters. Some basic assumptions and links are discussed.
W76-06784

EVAPORATIVE COOLING OF 'DELICIOUS' APPLES: THE ECONOMIC FEASIBILITY OF REDUCING ENVIRONMENTAL HEAT STRESS,
North Carolina State Univ., Raleigh. Dept. of Horticultural Science.
For primary bibliographic entry see Field 3F.
W76-06791

2E. Streamflow and Runoff

ROLE OF BOGS IN THE FORMATION OF SPRING FLOOD RUNOFF LOSSES IN THE DRAINAGE BASINS OF THE NORTHWESTERN EUROPEAN USSR,
For primary bibliographic entry see Field 4A.
W76-06175

FORMATION OF WATER AND SEDIMENT DISCHARGE DURING THE SPRING FLOOD ON A SLOPE AND IN A SMALL GULLY-RAVINE DRAINAGE BASIN,
For primary bibliographic entry see Field 2J.
W76-06176

SEDIMENT RESERVOIRS IN THE CHANNELS OF SMALL MOUNTAIN RIVERS,
For primary bibliographic entry see Field 2J.
W76-06177

SOME CHARACTERISTICS OF THE PROCESS OF INCOMPLETE MEANDERING OF THE CHANNEL OF THE UPPER OB' RIVER,
For primary bibliographic entry see Field 4A.
W76-06178

MEASUREMENT OF THE STRUCTURE OF RIVER FLOW,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
B. A. Fidman, A. S. Orlov, and V. S. Morozenkov.
Soviet Hydrology, Selected Papers, No. 6, p 551-560, 1973. 8 fig, 10 ref. Translated from (Water Resources) Vodnyye resursy, No. 6, p 107-117, 1973.

Descriptors: *Flow, *Streamflow, *Rivers, *Model studies, Mathematical models, Measurement, *Turbulence, Velocity, Instrumentation, Profiles, Flow profiles, Hydrology.
Identifiers: Velocity pulsations.

An analysis of the method of measuring river turbulence and the results obtained showed that the developed equipment is suitable for field investigations of flow characteristics, determined by the large-scale component of longitudinal velocity. The proposed relations permitted estimating the error and selecting optimum measurement conditions. The results of the measurements confirmed the presence of a standard deviation profile of longitudinal pulsations, referred to dynamic velocity, close to the universal profile, but gave no reason to believe that disturbances of a scale exceeding depth exist in the structure. (Sims - ISWS)
W76-06180

PRODUCTION CONDITIONS IN TROUT BROOKS OF BESKID MOUNTAINS: RESULTS OF RESEARCH CARRIED OUT WITHIN THE FRAMEWORK OF THE I.B.P. IN THE YEARS 1966 TO 1971,
Brno Univ. (Czechoslovakia). Hydrobiologicka Laborator.
J. Helan, F. Kubicek, B. Losos, E. Sedlak, and M. Zelinka.
Folia Fac Sci Nat Univ Purkynianae Brun Biol. 14(4): 1-103. Illus. 1973.

Descriptors: *Periphyton, *Zoobenthos, Diatoms, Algae Chlorophyll, *Analysis, Fish populations, Trout, Brook trout, Europe.
Identifiers: Beskid Mts., Czechoslovakia.

Collections from trout brooks in the Beskid Mountains, Czechoslovakia included 29 spp. from the periphyton and 138 spp. from the zoobenthos. The species composition of natural and artificial substrata was similar and was predominantly of diatoms. Significant correlations between abundance of algae quantity of organic matter and quantity of chlorophyll A, were found. Average gross primary production of the artificial substratum was 60.3 mg O2/m2/h. Development of periphyton was influenced by discharge rates of water and local light conditions. Insect groups comprising the zoobenthos were assessed in terms of numbers, weight and production. Changes in discharge rates, speed of streaming, temperature and conversion from pools to torrential zones, influenced distribution of the fauna. Different fishstocks did not appear to affect composition of the zoobenthos. Furthermore, excessive fishstock did not substantially effect its quantity and composition.--Copyright 1975, Biological Abstracts, Inc.
W76-06241

A PRE-IMPOUNDMENT STUDY OF THE FISH FAUNA OF INDIAN CREEK, DEKALB COUNTY, ILLINOIS,
Washington Univ., Seattle. Fisheries Research Inst.
A. W. Drew, and D. M. Wildrick.
Trans Ill State Acad Sci. 67(1), p 68-73, 1974.

Descriptors: *Pre-impoundment, Fish, Distribution, Illinois, *Fish populations, Rotenone.
Identifiers: Cyprinid, Dekalb(Ill), Diversity, *Indian Creek(Ill).

A pre-impoundment study of the fish fauna of Indian Creek (Illinois, USA) was conducted to determine both species composition and distribution patterns. Diversity indices are presented for collection stations. Increased diversity was found at stations having increased water depth. Two headwater cyprinid species are apparently replaced downstream by 3 other minnow species. The possible consequences of poisoning Indian Creek with rotenone are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-06251

DEPOSITIONAL MODELS AND THE SHINARUMP MEMBER AND THE SONSELA SANDSTONE BED OF THE CHINLE FORMATION NORTHEASTERN ARIZONA AND NORTHWESTERN NEW MEXICO,
Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 2J.
W76-06258

FLOOD PLAIN MAPPING,
Hydrocomp, Inc., Palo Alto, Calif.
R. K. Linsley.
Simulation Network Newsletter, Vol. 7, No. 4, p 1-8, May 15, 1975. 5 fig, 1 tab, 10 ref.

Descriptors: *Simulation analysis, *Flood forecasting, *Hydrology, Rainfall, Data collections, Model studies, Watershed management, Streamflow forecasting, Computers.

In order to set premiums for flood insurance, continuous simulation computer models are specifying the various levels of probability of flooding. Conventional hydrology in flood plain mapping has the problems of limited data, inadequacy of the design rainfall approach, and limitations from assumptions and simplifications. Continuous simulation transforms a long series of rainfall data into streamflow by algorithm representing the hydrologic processes. With sufficient rainfall data, the output is continuous without assuming any specific design rainfall. Probability analysis of this data defines flood levels throughout the watershed without invoking the assumptions inherent in use of backwater methods. The Hydrocomp Simulation Program is adapted to a particular watershed by adjusting parameters such as overland flow slope and length, extent of vegetative cover, and stream pattern in the watershed and area. For ungaged watersheds the parameters are estimated from adjacent gaged watersheds. Where conditions within the watershed vary substantially, it is subdivided into segments with a separate set of parameters for each segment. The data analysis is obtained from the National Weather Service and the U.S. Geological Survey. (Loustau-FIRL)
W76-06312

DISTRIBUTION FUNCTIONS LIMITED AT THE ORIGIN (IM URSPRUNG BEGRENZTE VERTEILUNGSFUNKTIONEN),
For primary bibliographic entry see Field 2A.
W76-06316

THE BLACK HILLS (SOUTH DAKOTA) FLOOD OF JUNE 1972: IMPACTS AND IMPLICATIONS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. K. Orr.
General Technical Report RM-2, March 1973. 12 p. 17 fig, 4 tab, 4 ref.

Descriptors: *Historic flood, *Flood damage, *Hydrologic aspects, *Excessive precipitation, Flash floods, Flood disasters, *South Dakota.
Identifiers: *Black Hills(S Dak), Hydrologic conditions, Record rainfall.

Rains of 12 inches or more in 6 hours fell on the east slopes of the Black Hills the night of June 9, 1972. Resulting flash floods exacted a disastrous toll in human life and property. Rainfall and discharge so greatly exceeded previous records that recurrence intervals have been presented in terms of multiples of the estimated 50- or 100-year event. Quick runoff was produced in the heaviest rainfall areas regardless of hydrologic condition. Flood sources included all major geologic and soil types and practically all land uses in the Black Hills. The highest measured peak runoff per unit area came from a 7-square-mile drainage, all of sedimentary formations, the upper portion of which burned over in 1936, but which is now well vegetated, apparently stable, and in good hydrologic condition. Greatest damage occurred where man-origin debris piled up against bridges, highways, homes, and other improvements. (Forest Service)
W76-06360

FLOOD OF JUNE 1971 FORT NELSON AND MUSKWA RIVERS,
Department of the Environment, Vancouver (British Columbia). Inland Waters Directorate (Pacific Region); and Department of the Environment, Vancouver (British Columbia). Water Resources Branch.
A. G. Smith.
Technical Bulletin No. 85, 1975, 49p, 33 fig, 18 ref, append.

Descriptors: *Floods, *Snow, *Precipitation(Atmospheric), Geology, Analysis, Investigations, Snowmelt, Washouts, *Alaska, Flow rates.
Identifiers: *Fort Nelson River, *Muskwa River, Alaska Highway.

On June 16, 1971, runoff from heavy precipitation, combined with river channels already bankfull from snowmelt runoff, produced floods in the Muskwa River and Fort Nelson River Valleys of northern British Columbia. The instantaneous maximum flow of the Fort Nelson River near the Town of Fort Nelson has been estimated at 234,000 cfs, the largest flow since records began in 1961. The instantaneous maximum flow of the Muskwa River near Fort Nelson has been estimated at 165,000 cfs, the largest flow since records began in 1944. (Environment Canada)
W76-06367

SURFACE WATER DATA, REFERENCE INDEX, CANADA 1975.
Canada Centre for Inland Waters, Burlington (Ontario); and Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W76-06377

FLOOD DAMAGE REDUCTION POTENTIAL OF RIVER FORECAST,
Wisconsin Univ., Green Bay. Coll. of Environmental Science.
For primary bibliographic entry see Field 6F.
W76-06435

FLOOD-PRONE AREAS OF GADSDEN COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-06443

RAINFALL-RUNOFF DATA FROM SMALL WATERSHEDS IN COLORADO, OCTOBER 1971 THROUGH SEPTEMBER 1974,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-06446

HYDROLOGICAL FORECASTING PRACTICES.
World Meteorological Organization, Geneva (Switzerland). Working Group on Hydrological Forecasting.
For primary bibliographic entry see Field 2A.
W76-06633

A GENERALIZED STREAMFLOW SIMULATION SYSTEM, CONCEPTUAL MODELING FOR DIGITAL COMPUTERS,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 2A.
W76-06634

SEASONAL STREAMFLOW ESTIMATION EMPLOYING SATELLITE SNOWCOVER OBSERVATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 4A.
W76-06638

USE OF RADAR INFORMATION IN DETERMINING FLASH FLOOD POTENTIAL,
National Weather Service, Garden City, N.Y. Eastern Region.
For primary bibliographic entry see Field 4A.
W76-06653

SYNTHESIS OF BASIN RESPONSE WITH INADEQUATE DATA,
Osmania Univ., Warangal (India). Regional Engineering Coll.
For primary bibliographic entry see Field 2A.
W76-06675

METHOD FOR REDUCING SINGLE DISCHARGE MEASUREMENTS TO THE AVERAGE DISCHARGE OF THE LOW-FLOW PERIOD,
B. L. Sokolov.
Soviet Hydrology, Selected Papers, No. 4, p 235-241, 1974. 5 fig, 1 tab, 6 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 213, p 171-181, 1974.

Descriptors: *Discharge(Water), *Base flow, *Streamflow, Data processing, Hydrogeology, Groundwater movement, Flow, Rivers, Streams, Hydrology.

Using conversion factors, single discharge measurements were reduced to the average discharge over periods when a river is fed only by groundwaters. The values of the conversion factors K are computed from the data of permanent gaging stations of the Hydrometeorological Service as the quotient of the division of the average discharge (discharge rate) over the low-flow period by the measured discharge. Several permanent observation stations were used as analog gaging stations on the principle of similarity of physiographic conditions, i.e., hydrogeological structure, drainage area, woodedness, waterlogging, etc. The arithmetic mean of the factor K, determined from several analog gaging stations (usually 2-3), was used as the final value. This proposed method is more justified for the Onega-Northern Dvina interfluve than the available methods because it allows for the effect of physiographic conditions on the patterns of variation of conversion factors and also because this factor is assigned on the basis of virtually all information on the water regime dur-

ing the summer-autumn period. This makes it unnecessary to search in each specific case for suitable analogs, which are selected on the basis of qualitative considerations of similarity of natural conditions in the basins and frequently mechanically from the agreement between conversion factors. (Sims-ISWS)
W76-06679

THE BED-LOAD FUNCTION,
Research Council of Alberta, Edmonton. Highway and River Engineering Div.
For primary bibliographic entry see Field 2J.
W76-06683

THE STREAM AND ITS VALLEY,
For primary bibliographic entry see Field 2A.
W76-06722

LIMNOLOGICAL AND MORPHOLOGICAL RELATIONSHIPS BETWEEN WATER AND RIVER BED IN THE LOWER COURSE OF THE THUR RIVER, (IN GERMAN),
B. Moergeli.
Viertel Jahrsschr Naturforsch Ges Zuer 119(1), p 23-124, 1974.

Descriptors: Rivers, *River beds, *Limnology, Channel morphology.
Identifiers: *Switzerland River thur.

Between Oct. 1969 - Dec. 1971, limnological and morphological investigations on the River Thur and its tributaries between Frauenfeld and Flaach were carried out. The object was to thoroughly explore the processes between the water and the river bed on a river in Eastern Switzerland.--Copyright 1975, Biological Abstracts, Inc.
W76-06736

A NATURAL HISTORY STUDY OF THE VASCULAR FLORA OF CEDAR BOG, CHAMPAIGN COUNTS, OHIO,
Urbana Coll., Ohio. Div. of Scientific Mathematics.
For primary bibliographic entry see Field 2H.
W76-06760

2F. Groundwater

KANSAS GROUNDWATER POLICY SEMINAR,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 4B.
W76-06154

DRAINAGE RATES FROM A VERTICAL COLUMN,
Colorado State Univ., Fort Collins.
H. J. Morel-Seytoux.
Hydrological Sciences Bulletin, Vol. 20, No. 2, p 249-255, June 1975. 2 fig, 3 ref. OWRT B-070-COLO (16), 14-31-0001-3566.

Descriptors: *Drainage, *Infiltration, *Model studies, *Equations, Infiltration rates, Rates, Recharge, Percolation, Drainage effects, Subsurface drainage, Unsaturated flow, Mathematical models, Moisture content, Groundwater, Aquifers, Soil water, Capillary action.
Identifiers: Water-air content, *Vertical column model, *Sand column model.

When both water and air movements are included in the formulation of infiltration or drainage problems, the problems of infiltration and drainage exhibit a natural symmetry. Methods of solution for one problem are applicable to the other type of problem. An equation of drainage was derived and it had precisely the same functional form as the equation derived for infiltration in a previous paper. (Prickett-ISWS)
W76-06165

THE ROLE OF GROUNDWATER IN RURAL SUPPLIES IN GHANA,
Ghana Water and Sewerage Corp., Bolgatanga.
For primary bibliographic entry see Field 4B.
W76-06169

NATURAL ISOTOPES IN SURFACE AND GROUNDWATER FROM ARGENTINA,
Council for Scientific and Industrial Research, Pretoria (South Africa). Natural Isotopes Div.
J. C. Vogel, J. C. Lerman, and W. G. Mook.
Hydrological Sciences Bulletin, Vol. 20, No. 2, p 203-221, June 1975. 10 fig, 2 tab, 31 ref.

Descriptors: *Isotope studies, *Surface waters, *Groundwater, *Radioactive dating, *Tracking techniques, Groundwater recharge, Dating, Age, Tracers, Analytical techniques, Oxygen isotopes, Carbon radioisotopes, Stable isotopes, Radioisotopes, Background radiation.
Identifiers: *Argentina, Water origin, Flow direction, Infiltration areas, Recharge areas, Carbon 14, Oxygen 18, Natural isotopes.

The naturally occurring isotopes radiocarbon, stable carbon-13 and oxygen-18 have been studied in surface and groundwater from six regions in Argentina. The 018 content of river and groundwater was used to trace the origin of the water, using its relation with altitude of the catchment area. The C14 ages obtained for groundwater range from recent to about 30,000 years and clearly indicate the direction of flow in some areas. Flow velocities of 3 to 10 m/year were found. (Prickett - ISWS)
W76-06185

HOT SPRINGS OF RHODESIA: THEIR NOBLE GASES, ISOTOPIC AND CHEMICAL COMPOSITION,
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
For primary bibliographic entry see Field 2K.
W76-06190

PUBLIC GROUNDWATER SUPPLIES IN PUTNAM COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-06237

A COMBINED MODEL OF WATER TABLE AND RIVER STAGE EVOLUTION,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 2A.
W76-06380

SOLUTION CHEMISTRY, MASS TRANSFER, AND THE APPROACH TO CHEMICAL EQUILIBRIUM IN POROUS CARBONATE ROCKS AND SEDIMENTS,
Illinois Univ., Urbana. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W76-06384

THICK BH HORIZONS IN THE NORTH CAROLINA COASTAL PLAIN: I. MORPHOLOGY AND RELATION TO TEXTURE AND SOIL GROUND WATER,
Soil Conservation Service, Beltsville, Md.
For primary bibliographic entry see Field 2G.
W76-06402

A COMPARISON OF THE GREEN-AMPT AND PHILIP TWO-TERM INFILTRATION EQUATIONS,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W76-06404

COMPUTING PHREATIC GROUNDWATER STORAGE,
Agricultural Research Service, Tifton, Ga.
L. E. Asmussen, and A. W. Thomas.
Research Bulletin 153, March 1974. 23 p, 9 fig, 3 tab, 10 ref.

Descriptors: *Storage, *Groundwater, Groundwater basins, Water balance, Hydrologic budget, Watersheds(Basins), Routing, Hydrology, Geomorphology, Water resources, Ponds, Seepage, Water supply, Aquifers, Transmissivity, Soil water, Hydrologic properties, Porosity, Geologic control, Hypsometric analysis, Water table, Distribution patterns, Maps, Rain, Irrigation, Evapotranspiration, Groundwater movement, Inflow, Equations, Methodology.
Identifiers: *Southern Coastal Plain, *Atlantic Flatwoods, *Grid system.

Shallow Quaternary aquifers, which are underlaid by relatively tight materials, are especially important in the Southern Coastal Plain. These sandy materials cause a large percentage of the precipitation to infiltrate, move laterally, and run off as return flow to ponds, pits, and streams. Quantitative methods for computing and expressing shallow groundwater volume and distribution within a watershed were discussed and compared. A grid method to subdivide the watershed into subareas for computing groundwater storage was found suited to all groundwater conditions, whereas, other techniques tested required a constant area. A pond and watershed water balance was made for 13 periods to exercise the principles suggested. The pond water balance showed a groundwater loss eight of the 13 periods; however, there was a total net groundwater gain of 0.82 acre-foot. A watershed water balance was made for the same periods using the computed groundwater seepage. The residual for this water balance was soil water, which showed a net gain of 1.36 area-inches. These techniques and descriptions will permit the routing of both surface and subsurface water through a watershed and will assign quantitative values to the hydrologic processes. (Visocky-ISWS)
W76-06409

ADVANCES IN HYDROSCIENCE, VOLUME 10-1975.
For primary bibliographic entry see Field 8B.
W76-06412

MODELING TECHNIQUES FOR GROUNDWATER EVALUATION,
Illinois State Water Survey, Urbana.
T. A. Prickett.
In: Advances in Hydroscience, Volume 10-1975. Academic Press, New York, New York, p 1-143, 1975. 69 fig, 6 tab, 332 ref.

Descriptors: *Groundwater, *Model studies, *Analog models, *Computer models, Mathematical models, Resistance networks, Hybrid computers, Finite element analysis, Computer programs, Numerical analysis, Analytical techniques, Simulation analysis, Aquifers, Groundwater movement.
Identifiers: *Groundwater basin management, *Groundwater reservoirs, *Sand tank models, Groundwater evaluation.

The most frequently cited differential equations governing the flow of groundwater were outlined. The presentation of these equations introduced common nomenclature. The modeling techniques were then outlined under the groups of analogs, analytical and numerical techniques, and sand tank models. Each section included the basic theory, a brief background of the available literature, derivation of formulas, scale factor definition when necessary, a case history when ap-

propriate, model verification procedures, and a discussion of advantages, disadvantages, and errors. References were grouped by subject matter at the end of the article and thus depart from the usual single alphabetical listing. The reference section has subject matter headings identical with those of the text. The reference list is extensive, containing papers not necessarily cited in the text. This was done so that the reader would have a more complete bibliography for further research if desired. Although studies of individual well hydraulics were mentioned, the emphasis was given to regional groundwater resource evaluation. Details have been purposely omitted since they can be found in the literature. (See also W76-06412) (Pricket-ISWS)
W76-06413

HYDROTHERMAL CONVECTION IN SATURATED POROUS MEDIA,
Bordeaux-1 Univ., Talence (France).
M. A. Combarnous, and S. A. Bories.
In: Advances in Hydroscience, Volume 10-1975, Academic Press, New York, New York, p 231-307, 1975. 60 fig, 1 tab, 86 ref.

Descriptors: *Porous media, *Aquifers, *Heat transfer, *Model studies, Theoretical analysis, Laboratory tests, Thermal water, Geothermal studies, Subsurface waters, Convection, Mixing, Temperature, Thermal properties, Snow cover, Aquifer characteristics, Boundaries(Surfaces), Boundary processes, Dimensional analysis, Mathematical studies, Numerical analysis, Saturated flow, Groundwater movement.
Identifiers: Hydrothermal convection, Thermohaline convection.

Generally speaking, convective movements in a porous layer have two main effects. They first tend to homogenize the whole fluid volume where they take place. They also help produce a nonuniform in situ temperature distribution characterized by hot and cold zones. Thermal convection in aquifers must be taken into account for: (1) the contribution of the 'homogenizing effects' of convective movements to the spreading of a pollutant, (2) the influence on the efficiency of industrial plants using hot deep-lying groundwater, and (3) the influence of a nonuniform temperature field resulting from convection in infrared photographic exploration. Subject areas presented were heat transfer in porous media, mathematical formulations for thermal convection, theoretical approaches, experimental results for free convection in horizontal layers, free convection in sloped areas, numerical computations for free convection, combined free and forced thermal convection, and free convection in more complex configurations. Some results obtained for complex configurations were given in an attempt to explain that, in the field of thermal convection in porous media, numerous problems still have to be solved. It was emphasized that, even in the classic case of natural convection in homogeneous media for a simple configuration, the solutions to some research problems have not been completely formulated. For instance, this is the case for the transition criteria between the various types of flow observed in sloping layers bounded by isothermal planes, or for possible improvements in the mathematical description of heat transfer. (See also W76-06412) (Humphreys-ISWS)
W76-06415

THE MIOCENE AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-06445

AQUEOUS SOLUBILITY OF PETROLEUM AS APPLIED TO ITS ORIGIN AND PRIMARY MIGRATION,
Geological Survey, Denver, Colo. Office of Energy Resources.
For primary bibliographic entry see Field 4B.
W76-06455

SOUTHEASTERN MICHIGAN WATER-RESOURCES STUDY: GROUND WATER AND GEOLOGY,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 4B.
W76-06457

PROGRESS REPORT ON THE WATER RESOURCES INVESTIGATION OF MARTIN COUNTY, FLORIDA,
Geological Survey, Tallahasee, Fla.
For primary bibliographic entry see Field 4B.
W76-06459

GROUND-WATER IN NEW MEXICO, 1973,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 7C.
W76-06460

SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE -GROUNDWATER USAGE - PHASE 2,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-06551

GROUNDWATER RESOURCES OF ALTUNKUPRI AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 4B.
W76-06576

FINITE STATE MIXING-CELL MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
E. S. Simpson, and L. Duckstein.
Typescript, 1975. 19 p, 7 fig, 2 tab, 5 ref.

Descriptors: *Computer models, *Karst hydrology, *Simulation analysis, *Groundwater movement, *Mass transfer, Model studies, Groundwater, Synthetic hydrology, Flow, Groundwater resources, Energy transfer, Mathematical studies, Probability, Hydrogeology.
Identifiers: Finite State Mixing-Cell Models.

In this first paper of a two-part series a quasi-physical, finite-state model is developed for modeling karstic water resources in a systems framework. The model consists of a set of interconnected cells of any desired size through which the transport of water and dissolved matter is represented by a sequence of finite states governed by a set of recursive equations. Energy transport is represented by rules governing a changr of cell size from one iteration to the next. Each elementary cell may be either a pure mixing-cell or a cell that simulates partial or complete piston flow (no mixing). The proposed finite-state model responds to a real need created by the impossibility of solving the inverse problem with partial differential equations, and the lack of physical basis of black box models. In addition, the model can deal with mass transport data (many different tracers) and energy transport data (hydrograph and change in storage) and may lead to useful managerial applications such as estimates of the probability distribution function of storage volume. It is simple, flexible and inexpensive to operate, but much depends on the skill and intuition of the modeler in devising a model based on incomplete and scattered data. (See also W76-06595) (Robinett-Arizona)
W76-06594

UNCERTAINTIES IN KARSTIC WATER RESOURCES SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein, and E. S. Simpson.
Typescript, 1975. 17 p, 4 fig, 3 tab, 17 ref.

Descriptors: *Karst hydrology, *Groundwater movement, *Risks, *Systems analysis, *Computer models, Management, Simulation analysis, Model studies, Groundwater, Synthetic hydrology, Flow, Hydrogeology, Groundwater resources, Probability.
Identifiers: Finite State Mixing-Cell Model.

A framework to describe, analyze, an trade off uncertainties present in karstic water resources systems. Finite state model (See W76-06594) is presented to illustrate the effect of some of the physical uncertainties, particularly input upon decision making. A discrete system framework is used to establish a two-way classification of five system elements versus six types of uncertainties. Typical system elements include rainfall (input), cavity size (state), rainfall discharge relationships (state transition function), benefit-cost (output), and loss curves (output function). Uncertainty types may be natural, model, sample, economic, technological, or strategic. The finite state model is used to find how input uncertainty affects output, and a complete Bayesian analysis of input uncertainty leads to the evaluation of the value of perfect information and the worth of one more sample point. Information provided on the effect of various uncertainties make possible optimal allocation of resources, decreasing the overall uncertainty in the decision-making process. (Robinett-Arizona)
W76-06595

WEATHERING AND HYDROGEOLOGY OF THE BRUMUNDDAL SANDSTONE, SOUTHERN NORWAY,
Norges Landbrukshoegskole, Vollebekk. Geologisk Institutt.
J. O. Englund, and P. Jorgensen.
Nordic Hydrology, Vol. 6, No. 1, p 43-62, 1975. 10 fig, 5 tab, 20 ref.

Descriptors: *Groundwater, *Sandstones, *Hydrogeology, Europe, Wells, Montmorillonite, Porosity, Permeability, Cation exchange, Groundwater resources, Groundwater availability, *Weathering, *Water wells.
Identifiers: *Brumunddal sandstone, *Norway, Water-deposited sediments, Hematite pigment, Plagioclase, Groundwater composition.

During the last decades several wells giving yields up to 100,000 liter per hour have been drilled in the reddish Brumunddal Sandstone, which covers an area of approximately 10 sq km near lake Mjosa, Southern Norway. Most of these wells have yields below 10,000 liter per hour, and those with higher yields are situated along prominent fracture zones. Textural data strongly support the assumption of an eolian origin for this sandstone, but water-deposited sediments are found within the formation. Most of the grains are coated with a hematite pigment, which was probably epigenetically formed. Post-sedimentary but preglacial weathering processes have transformed plagioclase to montmorillonite. This has changed the porosity as well as the permeability and increased the cationic exchange capacity. A transformation of plagioclase is in agreement with the groundwater composition. (Lee-ISWS)
W76-06676

MONITORING GROUND-WATER QUALITY NEAR A SANITARY LANDFILL,
Earthview, Incorporated, Toledo, Ohio.
For primary bibliographic entry see Field 5A.
W76-06684

RAPID RECHARGE IN A LIMESTONE AQUIFER,
Birmingham Univ.,(England). Dept. of Civil Engineering.
I. A. Fox, and K. R. Rushton.
Ground Water, Vol. 14, No. 1, p 21-27, January-February 1976. 6 fig, 1 tab, 5 ref, 1 append.

Descriptors: *Groundwater, *Recharge, *Model studies, Computer models, Analog models, Infiltration rates, Soil water movement, Aquifer characteristics, Natural recharge, Mathematical models, Precipitation(Atmosphreic).
Identifiers: Limestone aquifers, Seasonal variations, Piezometric head.

The introduction of an infiltration mechanism called rapid recharge assists in the mathematical modeling of large seasonal variations in the response of the confined portion of a limestone aquifer. Such modeling employs the technique of using an interactive analogue-digital computer, together with a new method of utilizing standard hydrological input data. (Gibb-ISWS)
W76-06685

FIBONACCI SEARCH FOR HIGH-YIELD WELL SITES,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-06686

PUMPING TEST ANALYSIS WHEN PARAMETERS VARY WITH DEPTH,
Birmingham Univ., (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-06687

2G. Water In Soils

DRAINAGE RATES FROM A VERTICAL COLUMN,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2F.
W76-06165

INFILTRATION OF ORGANIC PHOSPHATE COMPOUNDS IN SOIL,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 5B.
W76-06170

BULK DENSITY SAMPLER FOR DEEP SOIL PROFILES,
California Univ., Riverside.
For primary bibliographic entry see Field 7B.
W76-06171

ROLE OF BOGS IN THE FORMATION OF SPRING FLOOD RUNOFF LOSSES IN THE DRAINAGE BASINS OF THE NORTHWESTERN EUROPEAN USSR,
For primary bibliographic entry see Field 4A.
W76-06175

MELTWATER LOSSES THROUGH INFILTRATION INTO PODZOLIC SOILS AND CHERNOZEMS,
V. V. Romanov, K. K. Pavlova, and I. L. Kalyuzhnyy.
Soviet Hydrology, Selected Papers, No. 1, p 32-42, 1974. 3 fig, 5 tab, 8 ref, 1 append. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 214, p 106-122, 1974.

Descriptors: *Melt water, *Runoff, *Infiltration, *Soils, Podzols, Chernozems, Snow, Snowfall, Melting, Snowmelt, Forests, Forest soils, Frozen soils, Soil moisture.
Identifiers: *USSR.

Meltwater infiltration into frozen soil depends on the initial moisture and temperature of the soil and its thermophysical properties. The phase composition of water in freezing soil has the greatest effect. The phase transformations are intense in the temperature interval from 0 to -3.0 C in the loamy soils of the basins of the Don and Tosna rivers, and the content of unfrozen water changes little at temperatures from -5 to -20 C. At negative soil temperatures of about -10 to -20 C, the content of unfrozen water amounts to 10-16% in Chernozem loams and to 3-7% in Podzolic soils. The amount of unfrozen water depends on the specific surface of the soil and this relation differs for well structured and poorly structured soils. At temperatures from 0 to -10 C an impermeable layer forms in Chernozem loams and Podzolic soils at an initial moisture content equal to or greater than 0.3-0.4 of volume (50-60% of total pore volume). The volume of water lost through infiltration into frozen soils in the forest zone is apparently determined mainly by the water absorbing capacity of the soils. Therefore, the spring flood runoff coefficient in wooded drainage basins depends on the moisture deficit in the forest soils. (Sims - ISWS)
W76-06181

ORIENTATION OF SOIL STRIPES CAUSED BY NEEDLE ICE,
British Columbia Univ., Vancouver. Dept. of Geography; and British Columbia Univ., Dept. of Geological Sciences.
For primary bibliographic entry see Field 2C.
W76-06187

SUBARCTIC PLANT COMMUNITIES AND ASSOCIATED LITTER AND SOIL PROFILES IN THE CARIBOU CREEK RESEARCH WATERSHED, INTERIOR ALASKA,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
For primary bibliographic entry see Field 4D.
W76-06194

EFFECT OF PHOSPHORUS AND SULPHURSPHATES ON MOVEMENT OF PHOSPHORUS AND SULPHUR IN TWO SOILS,
New Zealand Fertilizer Manufacturers Research Association, Inc., Papatoetoe.
F. B. Muller, and G. McSweeney.
N Z J Exp Agric. 2(1): 53-62. Illus. 1974.

Descriptors: *White clover, Clovers, *Phosphates, Phosphorus, Sulphur, Nutrients, *Soil analysis, *Fertilizers, Leaching, Particle size, Granules, *Soil contamination effects.
Identifiers: Trifolium-Repens.

The uptake of P and S from superphosphates in granular and powder fors by New Zealand white clover (Trifolium repens L. 'Grasslands Huia') on 2 soils and the movement of these nutrients into the drainage were studied. At the rate of fertilizers used and the range of particle sizes there were no significant differences between the powdered and granulated material in total herbage production. Similarly, there were no significant differences between ordinary superphosphate and the S-fortified materials in dry matter production. On soils with low S-retention capacity use of powdered fertilizers was likely to lead to large losses of S by leaching. For calcium sulfate fertilizers granulation greatly reduced leaching losses. Losseswith elemental S were also reduced bygranulation or by the use of coarser S. On S-deficient soils use of phosphates alone would give reduced yields, as would S alone on phosphate-deficiient soils. Use of S alone to correct S deficiency would run the risk of reduced yield in time due to insufficient P. The converse, namely the use of superphosphate, would apply on P-deficient soils, which would ultimatelybecome S deficient. Unlike S, there was no movement of P into leachates during the trial, which indicates little likelihood of P enrichment of naturl waters by this pathway.--Copyright 1975, Biological Abstracts, Inc.
W76-06242

CADMIUM AND ZINC CONTENTS OF CORN LEAF AND GRAIN PRODUCED BY SLUDGE-AMENDED SOIL,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W76-06304

SIGNIFICANCE OF TRACE METALS AND NITRATES IN SLUDGE SOILS,
Environmental Protection Agency, Columbus, Ohio. Div. of Waste Management and Engineering.
For primary bibliographic entry see Field 5E.
W76-06307

PHOSPHATE SORPTION CHARACTERISTICS OF SOILS TREATED WITH DOMESTIC WASTE WATER,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 5B.
W76-06330

EFFECT OF SEWAGE SLUDGE ON SOME SOIL PHYSICAL PROPERTIES,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5E.
W76-06331

TRACE ELEMENT CONCENTRATIONS OF SEWAGE TREATMENT PLANT EFFLUENTS AND SLUDGES; THEIR INTERACTIONS WITH SOILS AND UPTAKE BY PLANTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-06332

CHEMICAL COMPOSITION AND YIELD OF SOYBEANS AS AFFECTED BY IRRIGATION AND DEEP PLACEMENT OF LIME, PHOSPHORUS AND POTASSIUM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Agriculture.
For primary bibliographic entry see Field 3C.
W76-06338

RECOVERY FROM SOIL COMPACTION ON BLUEGRASS RANGE IN THE BLACK HILLS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-06362

THE GROWTH OF DISTURBANCES IN UNSTABLE INFILTRATION FLOWS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia), Div. of Environmental Mechanics.
J. R. Philip.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1049-1053, November-December 1975. 3 fig, 3 ref.

Descriptors: *Soil water movement, *Unsaturated flow, *Mathematical models, *Laboratory tests, *Infiltration, Hydrodynamics, Heterogeneity, Moisture content, Wetting, Depth, Pressure head, Atmospheric pressure, Velocity, Equations, Hydraulic conductivity.

Identifiers: Disturbances, *Unstable flow, Delta-function model, Wave number, Amplification, Fingering.

The stability analysis of the delta-function model of infiltration yields a maximum wave-number for unstable disturbances, Merit, and a wave-number for maximum amplification, M*. The 'column effect,' i.e. the suppression of instability in laboratory columns, depends on Mcrit; and the dimensions of fingers in unstable flows can be expected to depend on M*. When instability is induced by a sudden jump of G, the water pressure gradient behind the wetting front, Mcrit and M* may be evaluated simply and directly. When, on the other hand, instability emerges during gradual increase of G, it is necessary to study the amplification of disturbances during the whole course of increase of G through positive values. Such a study was made for one example of instability induced by air compression and for one where it was induced by increase of conductivity with depth. Both exhibited qualitatively similar patterns of amplification: disturbances of small M (wave-number) begin to be amplified sooner, but ultimately overtaken by some disturbances of larger M starting later. Definite values of M* were found, and the results discussed with special reference to fingering and to the column effect. (Visocky-ISWS)
W76-06398

LOESS IN OHIO IN RELATION TO SEVERAL POSSIBLE SOURCE AREAS: I. PHYSICAL AND CHEMICAL PROPERTIES,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 2J.
W76-06399

LOESS IN OHIO IN RELATION TO SEVERAL POSSIBLE SOURCE AREAS: II. ELEMENTAL AND MINERALOGICAL COMPOSITION,
Ohio State Univ., Columbus, Dept. of Agronomy.
For primary bibliographic entry see Field 2J.
W76-06400

NITRATE MOVEMENT AND ITS DISTRIBUTION IN THE SOIL PROFILE OF DIFFERENTIALLY FERTILIZED CORN WATERSHEDS,
Agricultural Research Service, Cheyenne, Wyo.
For primary bibliographic entry see Field 5B.
W76-06401

THICK BH HORIZONS IN THE NORTH CAROLINA COASTAL PLAIN: I. MORPHOLOGY AND RELATION TO TEXTURE AND SOIL GROUND WATER,
Soil Conservation Service, Beltsville, Md.
R. B. Daniels, E. E. Gamble, and C. S. Holzhey.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1177-1181, November-December 1975. 6 fig, 1 tab, 9 ref.

Descriptors: *Soil horizons, Stratigraphy, *Geomorphology, *Decomposing organic matter, *Humic acids, *North Carolina, Analytical techniques, Humus, Geology, Organic matter, Organic soils, Organic compounds, Sediment sorting, Soil chemistry, Sediment transport, Soil texture, Soil water, Groundwater, Humic acids, Coastal plains, Groundwater movement.
Identifiers: Spodic horizons, *Spodosols, *Bh horizons, Pink Hill area(NC), Soluble organics, Humus accumulations.

Spodosols in North Carolina have thick, vertically continuous Bh horizons wherever the parent material is a sand or loamy sand texture that has a high water table and a downward flow of groundwater. These Bh horizons are 5-9 m thick, and their lower boundaries are always a few centimeters above a less permeable layer or a bed of green-gray sand. Pollen counts and the general morphology indicated that the thick Bh horizons are post depositional features. Percolating organics, monitored by shallow wells, move from the surface downward in quantities greater than necessary to account for the whole Bh horizon thickness. (See also W76-06403) (Henley - ISWS)
W76-06402

THICK BH HORIZONS IN THE NORTH CAROLINA COASTAL PLAIN: II: PHYSICAL AND CHEMICAL PROPERTIES AND RATES OF ORGANIC ADDITIONS FROM SURFACE SOURCES,
Soil Conservation Service, Beltsville, Md.
C. S. Holzhey, R. B. Daniels, and E. E. Gamble.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1182-1187, November-December 1975. 3 fig, 6 tab, 14 ref.

Descriptors: *Soil horizons, *Decomposing organic matter, *Chemical properties, *Physical properties, *Humic acids, *North Carolina, Atlantic Coastal Plain, Humus, Organic matter, Analytical techniques, Organic soils, Soil chemistry, Sediment transport, Chemistry, Chemical analysis, Mineralogy, *Path of pollutants.
Identifiers: *Spodic horizons, *Bh horizons, Mobile organic matter, Organic enrichment, Pink Hill area(NC), Mobile constituents, Exchangeable salts.

Thick Bh horizons in siliceous sands of the North Carolina Coastal Plain have essentially no extractable iron, and very small quantities of calcium, magnesium, and potassium. Aluminum is the dominant cation and the exchange properties of the Bh horizons are dominated by Al and organic carbon. One to two grams of total Ca, Mg, and Na/sq m per yr are being added to these soils by rainfall and recycling. From 3 to 40 g of carbon/sq m per yr is available to move into the solution below 10 cm. This is enough carbon to develop a Bh horizon 7 m thick in less than 30,000 years. The mechanism that immobilizes the carbon to form the Bh horizon is open to question. It was postulated that bases, pH changes, or other aspects of the chemical environment may have immobilized the carbon initially, but these causes have subsequently been removed or changed through leaching. Another alterna tive is organo-mineral bonding such as with silica on quartz surfaces that may be the major factor in the immobilization of carbon. (See also W76-06402) (Henley - ISWS)
W76-06403

A COMPARISON OF THE GREEN-AMPT AND PHILIP TWO-TERM INFILTRATION EQUATIONS,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
Y-S. Fok.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 6, p 1073-1075, November-December 1975. 1 tab, 12 ref.

Descriptors: *Infiltration, *Equations, *Soil water movement, Darcys law, Seepage, Velocity, Hydraulic conductivity, Unsaturated flow, Percolation, Wetting, Soil surfaces, Head loss, Depth, Pore pressure, Porosity, Soil profiles, Soil moisture, Sorption.
Identifiers: *Green-Ampt equation, *Philip two-term equation.

The Green-Ampt equation is regaining popularity. The equation is a simple algebraic expression with a physical basis and utilizes parameters that can be evaluated from soil physical properties. The Philip two-term equation is also gaining popularity, because it has a theoretical basis and is adapted to fitting to observed infiltration data. The Philip two-term equation was shown to be derivable from the Green-Ampt equation, and the differences between these two equations were tabulated. The maximum difference is less than 17%. (Visocky - ISWS)
W76-06404

RECOVERY FROM SOIL COMPACTION ON BLUEGRASS LANGE IN THE BLACK HILLS,
Forest Service (USDA), Rapid City, S. D. Rocky Mountain Forest and Range Experiment Station.
H. K. Orr.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 6, p 1076-1081, November-December 1975. 10 fig, 4 tab, 10 ref.

Descriptors: *Soil compaction, *Bluegrasses, *Ranges, *South Dakota, Soils, Soil mechanics, Compaction, Livestock, Climates, Overland flow, Infiltration, Percolation, Precipitation(Atmospheric), Bulk density, Vegetation, Compacted soils, Grazing, Range management, Runoff.
Identifiers: *Bluegrass range, *Black Hills(SD), Recovery, Soil core samples, Livestock grazing, Trampling, Overland runoff, Macropore volume, Fencing.

Intensive livestock grazing in bluegrass meadows and stream-bottoms in the Black Hills has resulted in compaction of the soil. Not until the second year after fencing did soils show significant increases in macropore volume. Infiltration capacities also increased and summer runoff decreased. One soil was a medium-textured silt loam and the other was a sandy loam. At a third site where soil was medium-textured but high in organic matter content and with a low bulk density, soil responses were uncertain. Infiltration increases started to appear at about the same time as improvements in soil structure. Protection from grazing and trampling resulted in less summer storm runoff in the first growing season and also in each of the following three years. After the first winter, snowmelt runoff far exceeded summer storm runoff at all three sites. Overall results clearly indicated that more than one season protection was necessary for significant soil recovery, and degree of recovery continued up to at least four years, the duration of this study. (Roberts - ISWS)
W76-06405

METHOD FOR COMPUTING EVAPORATION DURING THE SNOW MELTING AND FLOOD PERIOD IN THE CENTRAL CHERNOZEM REGIONS OF THE EUROPEAN USSR,
For primary bibliographic entry see Field 2D.
W76-06407

COMPUTING PHREATIC GROUNDWATER STORAGE,
Agricultural Research Service, Tifton, Ga.
For primary bibliographic entry see Field 2F.
W76-06409

SOIL WATER POTENTIAL AND PLANT BEHAVIOR: A CASE MODELING STUDY WITH SUNFLOWERS,
Centre National de la Recherche Scientifique, Montpellier (France). Centre d'Etudes Phytosociologiques et Ecologiques.
C. H. M. Van Bavel.
Oecol Plant. 9(2), p 89-109, 1974.

Descriptors: *Soil water, Model studies, Soil-water-plant relationships, Crop response, Crops, Carbon dioxide, Energy, Behavior.
Identifiers: Potential, *Sunflowers.

A model to simulate the effect of soil water potential on the gas exchange by a plant leaf canopy is presented. The radiant energy distribution in the canopy is obtained by the Duncan method, as modified by Stewart, using leaf architecture and optics as inputs. The CO_2 and water vapor exchange for each leaf layer is found from a leaf gas and energy exchange submodel, previously described, in which the parameters of the aerial environment and the soil water potential are the inputs. The gas exchange of the entire canopy was calculated by the proposed model for a sunflower crop using the following assumed levels of soil

water potential: 0, -5, -10 and -15 bar. The calculated daily values of CO2 assimilation and transpiration were compared with actually measured values in the field. A reasonable agreement of well within 20% was obtained, and the hourly distribution also agreed with measured behavior. Detailed aspects of the model application showed that, in the sunflower crop, the soil water potential affects stomatal resistance so as to reduce both CO2 assimilation and transpiration when the soil becomes drier. A slight midday depression of the assimilation is also predicted for soil water potentials less than -5 bar. The results illustrate how environmental and plant physiological data, specifically regarding CO2 assimilation and water relations, can be combined to enable a reconstruction of the behavior of a crop-environment system under conditions of a limited water supply in the soil.--Copyright 1975, Biological Abstracts, Inc.
W76-06461

PORE WATER PRESSURE MEASURING DEVICE,
P. O. Jonell, and K. I. Elmgren.
U.S. Patent No. 3,935,745, 4 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 943, No 1, p 129, February 3, 1976.

Descriptors: *Patents, *Pore water, *Pore pressure, *Water pressure, *Porous media, *Soil physical properties, Soil compaction, Measurement, Subsurface water, Instrumentation.

A pore water pressure meter of the kind used to measure the water pressure inside masses of earth or clay is described. The pore water pressure meter incorporates a pressure meter, the force or motion is dependent on the pore water pressure to be measured, and a force meter (e.g. an extensiometer) arranged to be actuated by the pressure meter. The meter incorporates a power member which is arranged to apply a force on the pressure meter of such magnitude as to override the force exerted by the meter so as to prevent the pressure meter from affecting the force meter, and to thereafter remove the force from the pressure meter and allow the latter to again transmit its force to the force meter. It is possible to read the measuring value of the pressure meter as soon as the force of the pore water pressure meter has been removed, and, after re-application of the force of the pressure meter, to read the measure value of the force meter caused by the prevailing water pressure. There is no need to pull the rod together with the pore water pressure meter out of the mass of earth in order to recalibrate it. Before forcing the pressing meter down into the mass of earth it is possible to establish various frequency curves in the neighborhood of the zero pressure frequency curve and then, after the change of the zero pressure frequency, use any one of these extra curves as a reference curve in the subsequent measuring operations. (Sinha - OEIS)
W76-06477

SOIL MOISTURE REGIME OF UNSATURATED ZONE IN SOME ARID REGIONS,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
J. S. Dougrameji.
Technical Bulletin 81, June, 1975. 17 p, 3 fig, 4 tab, 11 ref.

Descriptors: *Soil-water-plant relationships, *Soil moisture, *Arid lands, *Drainage engineering, *Irrigation effects, Moisture content, Fallowing, Infiltration, Groundwater, Permeability, Soil management, Soil physical properties, Zone of aeration, Alfalfa, Irrigated land, Water injury, Wheat, Agriculture, Orchards.
Identifiers: *Diyala River Basin(Iraq).

A study of soil-water relationships under different cropping patternswas carried out in the Fudhaliya Experimental Station located in the Diyala river basin, 8 km northeast of Baghdad, Iraq. The basic hydrophysical properties of the soil in the experimental area are described as well as the changes which resulted in the soil moisture regime of the unsaturated zone under different crops for the period 1969-1971. The soils are characterized by heavy texture, high water holding capacity, low permeability, low infiltration rate, and slow but steady groundwater recharge. Because of the steady recharge and lack of a drainage system, a steady rise in the water table and consequent salinization of the soil was noted. Results indicated that soil cracks play an important role in reducing the soil moisture content through evaporation, and further indicated the need for a drainage system and lining of irrigation canals. The average annual increase in the actual moisture content of the soil was 3.1 percent, 5.3 percent, and 11.2 percent in wheat, alfalfa, and orchard respectively in comparison to fallow land. The increase in the actual moisture content of the soil between August 1968 & August 1970 was 0.5 percent, 0.9 percent, 6.1 percent, and 11.5 percent in wheat, fallow, alfalfa and orchard plots respectively. Recommendations include better soil-water management using an improved irrigation system, improvement of soil structure by mulching and deep plowing, and suitable crop rotations. (Robinett-Arizona)
W76-06578

INVESTIGATION OF SOME PHYSICAL PROPERTIES OF THE SOILS IN THE DALMAJ PILOT PROJECT AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
A. H. Al-Rawi, J. Z. Al-Rawi, H. J. Van der zel, and J. Vos.
Technical Bulletin 77, November, 1975. 45 p, 20 fig, 13 tab, 5 ref.

Descriptors: *Permeability, *Soil water movement, *Moisture content, Soil physical properties, *Irrigation effects, Infiltration, Soil analysis, Soil texture, Soil structure, Soil moisture, Field capacity, Retention, Bulk density, Soil investigations, Irrigated land, Correlation analysis.
Identifiers: *Dalmaj Pilot Project Area(Iraq).

Soil physical investigations at the Dalmaj Pilot Project Area situated in the northern part of Mazzaq Main Canal region in Iraq are described. Five experimental sites representing basin soils, silted river basin soils and irrigation levee soils were used for infiltration tests, soil moisture retention determinations and permeability measurements. Soil texture ranges from clay to loam with the total range in clay particles from 20 to 67 percent, the range in silt particles from 31 to 73 percent, and the range in sand particles from 2 to 20 percent. Average bulk density ranges from 1.4 to 1.6 g/cu cm, while permeability ranges from 50 to 110 cm/24 hours with 90 cm/24 hours as an overall average. Investigation of soil moisture showed that after irrigation the upper 30 cm of the soil profile was saturated with water, and at some sites the water did not penetrate below the 45 to 60 cm depth. Results indicated no sharp wetting front but a gradual decrease of the moisture content at each depth after irrigation. Results of the different soil physical determinations are presented in tables and graphs as are correlations between texture, available moisture and bulk density of the various soil units. (Robinett-Arizona)
W76-06579

CHARACTERISTICS AND CLASSIFICATION OF TWO SOILS IN DIYALA BASIN, IRAQ,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
J. S. Dougrameji.
Technical Bulletin 84, August, 1975. 20 p, 4 fig, 3 tab, 11 ref, append.

Descriptors: *Soil classification, *Soil chemical properties, *Soil physical properties, *Soil formation, *Soil-water-plant relationships, Soil horizons, Soil investigations, Soil profiles, River basins, Rivers, Alluvium, Flood plains, Deposition(Sediments), Soil texture, Calcium, Organic matter, Nitrogen, Phosphorus, Potassium, Salinity, Irrigation.
Identifiers: *Diyala Basin(Iraq).

Soil and hydrological studies were made in an area of about 125 hectares in the Diyala basin 8 kilometers northeast of Baghdad. The study revealed the presence of two distinct soil units which are representative of the Diyala-Tigris flood plain. The soils are alluvial, deposited by river and irrigation water of the Diyala and to a lesser extent Tigris rivers, and are part of a transition between high levee soils bordering the Diyala river and the heavy textured depression soils toward the west. The soils are characterized by weak to medium structure with distinct polygonal cracks, especially in the depression area. Soils are calcareous (over 19 percent lime), medium to fine textured (40-60 percent clay), low in organic matter, nitrogen and phosphorus, and medium to high in potassium. At the surface the soil is not saline, but salinity increases with depth. Without an artificial drainage system and special soil water management, the saline groundwater during flood season and under intensive cultivation constitutes a potential danger of salinization. In respect to general land use and soil irrigation capability, the two soil units are classified as class II and III for soils in the depression and high situated areas respectively. (Robinett-Arizona)
W76-06580

DRAINAGE AND RECLAMATION PERFORMANCE AT THE IMAM EXPERIMENTAL FIELD IN THE GREATER MUSSAYEB PROJECT, A MONITORING STUDY,
Institute for Applied Research on Natural Resources, Baghdad(Iraq).
For primary bibliographic entry see Field 3C.
W76-06581

EFFECT OF SALINIZATION ON CERTAIN SOIL MICROFLORA,
Institute for Applied Research on Natural Resources, Baghdad(Iraq).
For primary bibliographic entry see Field 5C.
W76-06582

SURFACE RUNOFF AND ITS EFFECT ON DIFFUSE SALT PRODUCTION FROM MANCOS SHALE MEMBERS,
Utah State University, Logan, Dept. of Civil and Environmental Engineering.
S. L. Ponce, R. H. Hawkins, J. J. Jurinak, G. F. Gifford, and J. R. Riley.
In: Watershed Management, Proceedings, Irrigation and Drainage Division American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p. 140-168. n.d. 10 fig, 13 tab, 9 ref.

Descriptors: *Surface runoff, *Soil chemical properties, *Salinity, *Shales, *Geologic formations, Vegetation effects, Alkalinity, Water quality, Utah, Colorado River Basin, Alluvium, Soil types, Precipitation(Atmospheric), Rainfall-runoff relationships, Electrical conductance.
Identifiers: *Price River Basin(Utah).

A study was done within the Price River Basin, one of the major sources of salinity to the Colorado River, located in east-central Utah. Results indicated that alluvial deposits very near the channel of a perennial stream tend to yield runoff water of high salinity. The Blue Gate and Mancos undivided shale members are the prime salt producers in the basin. No simple relation was found between soil salinity and salinity of the runoff water over the soil. A slight correlation was noted between geologic type and the ratio of surface runoff to precipitation, while hydrologic soil-complex numbers showed no distinct separation between types. Strong linear relations exist

between electrical conductivity and Ca(++) and SO4 (r-) while poor correlations exist between the ratio of surface runoff to precipitation and surface runoff to total solids for runoff from the Mancos members. (Robinett-Arizona)
W76-06583

INFLUENCE OF VESICULAR HORIZONS ON WATERSHED MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 4D.
W76-06596

IDENTIFICATION AND TREATMENT OF DISPERSIVE CLAY SOILS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 8D.
W76-06611

STABILIZATION OF CLAY SOILS AGAINST EROSION LOSS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W76-06640

CHEMICAL/BIOLOGICAL RELATIONSHIPS RELEVANT TO ECOLOGICAL EFFECTS OF ACID RAINFALL,
National Ecological Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5A.
W76-06650

CORRELATION OF DUAL-CHANNEL AIRBORNE IR DATA WITH SOIL MOISTURE MEASUREMENTS,
Development and Resources Transportation Co., Silver Spring, Md.
L. A. LeSchack, N. K. Del Grande, S. I. Outcalt, J. Lewis , and C. Jenner.
Final Report, May 1975. 64 p, 11 fig, 11 tab, 29 ref, 4 append. Contr. 4-35308.

Descriptors: *Soils, *Soil moisture, *Soil temperature, Moisture, Temperature, *Infrared radiation, Statistics, Statistical methods, Statistical models, Regression analysis, Correlation analysis.
Identifiers: Soil radiant emittance, Soil moisture data, Infrared airborne data, Cluster analysis.

To show that a positive correlation existed among the soil-moisture-radiant emittance data, cluster analysis was used to divide the raw radiant emittance data into two distinct groups. Regression analysis thereupon showed significant positive correlations. Corrected surface temperature data were compared with calculated values obtained using a Digital Surface-Climate Simulator Model. Additionally, a 'Student Paired-t Test' showed that both observed and simulated temperature data came from the same statistical population. The implication is that the model is a useful tool for estimating the effect of soil moisture on the energy radiated from the surface. (NOAA)
W76-06660

SOIL MOISTURE SURVEY EXPERIMENT AT LUVERNE MINNESOTA, DATE OF SURVEY: MAY 12, 1975,
EG and G, Inc., Las Vegas, Nev.
E. L. Feimster, and A. E. Fritzsche.
Report EGG-1183-1675, November 1975. 29 p, 7 fig, 6 tab, 2 ref, 2 append. NOAA Cont. no. 31-USC-686.

Descriptors: *Surveys, *Moisture, Soil moisture, *Moisture content, Gamma rays, Remote sensing, Electromagnetic waves, Data collections, Measurements, *Minnesota.
Identifiers: *Soil moisture survey, *Gamma radiation, Terrestrial gamma flux attenuation.

Results are presented of an aerial survey employing the measurement of natural terrestrial gamma radiation carried out over farm lands south of Luverne, Minnesota on May 12, 1975. The purpose of the survey was to determine soil moisture content. During the survey, soil moisture values were computed from airborne gamma data collected over five flight lines and compared to data collected over these same lines during a similar survey of March 6, 1973. These soil moistures were compared to soil moistures computed gravimetrically from soil samples taken along flight lines during the last survey. The results indicate very good agreement between the aerial and the ground measured soil moistures. The average soil moisture values for the 8-mi long survey lines derived from these aerial measurements were in good agreement with results from ground based soil sampling. Mile-by-mile averages of the aerial data ranged from 21 to 36% for Line A with an average of 27%. This compares well to the ground based soil moisture values ranging from 23 to 29% with an average of 28%. (NOAA)
W76-06663

SOIL MOISTURE SURVEY EXPERIMENT AT PHOENIX, ARIZONA, DATE OF SURVEY: MARCH 18, 1975,
EG and G, Inc., Las Vegas. Nev.
E. L. Feimster, A. E. Fritzsche, and C. Jupiter.
Rpt. No. EGG-1183-1674, November 1975. 29 p, 5 fig, 6 tab, append. NOAA Contract no. 31-USC-686.

Descriptors: *Surveys, *Moisture, *Soil moisture, Moisture content, Electromagnetic waves, Gamma rays, Remote sensing, Data collections, Measurements, *Arizona.
Identifiers: *Aerial surveys, *Soil moisture survey, Gamma radiation, Terrestrial gamma flux attentuation, Phoenix(Ariz).

An aerial survey employing the measurement of natural terrestrial gamma radiation was carried out over farm lands east of Phoenix, Arizona, on March 18, 1975. The purpose of the survey was to determine soil moisture by detecting differences in the terrestrial gamma flux attentuation as a function of soil moisture content. The average soil moisture value for the 16-mile long survey line 1, derived from these aerial measurements was 21.56%. Mile-by-mile averages of the aerial data ranged from 16.6% to 32.2%. This survey was carried out in order to offer an independent method of validating soil moisture data derived from aerial microwave and infrared measurements performed by the National Aeronautics and Space Administration. (NOAA)
W76-06664

THE RATE OF SPREAD OF FUEL OIL NO. 1,
Geological Survey of Sweden, Stockholm.
For primary bibliographic entry see Field 5B.
W76-06677

CHARACTERIZING THE SOIL MOISTURE DYNAMICS OF LOESS-BRAUNSTAUGHLEY SOILS IN THE LEOSS LOAM HILLY TRACT OF NORTHWEST SAXONY, (IN GERMAN),
J. Clausnitzer.
Arch Acker-Pflanzenbau Bodenkd 19(5); p. 337-346, 1975.

Descriptors: *Soil moisture, Europe, Loam, Soils, Loess, Climates, Soil horizons.
Identifiers: *Soil depth, E. Germany.

Soil moisture variations and thus also the occurrence of wet and dry stages strongly depend on weather conditions. During the vegetation period soil moisture variations decline with soil depth. Analysis of the soil moisture suction relations revealed that Loss-Braunsaugley soils dry out almost continuously from the top to the greater depths. A specific exhaustion coefficient shows that the differences in the soil moisture dynamics of the Loss-Braunstaugley soils cannot be explained by the differences in the sequence of horizons.--Copyright 1975, Biological Abstracts, Inc.
W76-06726

STUDIES ON THE EFFECT OF SOIL DENSITY, TEMPERATURE AND FERTILIZATION OF THE SOIL MOISTURE, VALUE OBTAINED WITH A DIELECTRIC MEASURING TECHNIQUE, (IN GERMAN),
W. Baehn.
Arch Ackerpflanzenbau Bodenkd 19 (5); p 355-364, 1975.

Descriptors: *Soil density, *Soil temperature, *Soil moisture, Measurements, Saline soils, Salinity, Fertilization, Fertilizers, Leaching, Instrumentation.

Model experiments were carried out with 4 different soils to test the soil moisture measuring instrument (working on the basis of the dielectric constant) of Sprigade. The effect of soil density, soil temperature and soil salinity on the measured values was determined. The effect of soil density was relatively small. Big errors of measurement were due to soil temperature variations which led to changes of soil conductivity. Because of its magnitude, this error cannot be neglected or sufficiently corrected. The measured value was influenced most strongly by the continuously changing soil conductivity resulting from continuously varying ion concentrations as a result of fertilization, leaching and extration by plants as well as of varying soil moisture. The values obtained with K and N fertilizers on soils of a low exchange capacity were particularly unfavorable.--Copyright 1975, Biological Abstracts, Inc.
W76-06727

WATER ECONOMY OF A SOIL ON WEATHERED GRANITE UNDER A SPRUCE GROVE, (IN FRENCH),
Paris-7 Univ. (France). Lab. of Biogeography.
C. Vallee, and A. Feodorff.
Bull Assoc Fr Etude Sol 2; p 119-131, 1974.

Descriptors: Weathering, Spruce, Soils, Soil moisture, Soil water, Granite.

To determine the possible influence of deforestation on the water economy of the Morvan granitic soils, 2 neighboring sites, one under spruces and the other within a recent cutting were submitted to periodic humidity measurements and continuous soil moisture stress recording at 2 levels for 2 yr. Differences were observed in the consumption of the soil water reserve of the 2 sites. It was much lower under the cutting than under the spruce grove.--Copyright 1975, Biological Abstracts, Inc.
W76-06728

INFLUENCE OF WATERLOGGING ON MICROBIAL MINERAL WEATHERING, (IN FRENCH),
Centre National de la Recherche Scientifique, Vandoeuvre-les-Nancy (France). Centre de Pedologie Biologique.
For primary bibliographic entry see Field 5C.
W76-06730

EFFECTS OF SOIL MOISTURE ON GROWTH OF JAPANESE RABDOSIA, (IN JAPANESE),
For primary bibliographic entry see Field 2I.
W76-06771

IRRIGATION OF FIELD TOMATOES AND MEASUREMENT OF SOIL WATER CHANGES BY NEUTRON MODERATION METHODS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-06793

2H. Lakes

THE WATER FAUNA OF THE HIGH MOUNTAIN GLACIER LAKES IN THE MANDARAS VALLEY IN THE HIGH HINDU KUSH, (IN POLISH),
Jagellonian Univ., Krakow (Poland). Instytut Zoologii Systematics; and Jagellonian Univ., Krakow (Poland). Instytut Zoogeography.
For primary bibliographic entry see Field 5C.
W76-06166

LEVEL OF CLOSED BODIES OF WATER AS ONE OF THE CRITERIA OF GLOBAL WATER EXCHANGE,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2A.
W76-06179

THE BIOGEOCHEMISTRY OF PHOSPHORUS IN AN EXPERIMENTAL LAKE ENVIRONMENT: EVIDENCE FOR THE FORMATION OF HUMIC-METAL-PHOSPHATE COMPLEXES,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W76-06203

THE PHYTOPLANKTON AND PRIMARY PRODUCTIVITY OF SOUTHERN INDIAN LAKE (MANITOBA), A HIGH LATITUDE, RIVERINE LAKE,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W76-06204

WATER CHEMISTRY AND FERTILITY OF TWENTY-THREE CONNECTICUT LAKES,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 5C.
W76-06207

CHANGES IN WATER QUALITY IN FINNISH LAKES AND RIVERS 1962-1973 (IN FINNISH WITH ENGLISH SUMMARY),
National Water Board of Finland, Helsinki. Research Inst.
For primary bibliographic entry see Field 5C.
W76-06212

A COMPARATIVE STUDY OF CHEMICAL LOADINGS OF ACID AND NON-ACID TRIBUTARIES OF CHEAT LAKE, WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W76-06213

THE PLANKTONIC CRUSTACEANS OF MONCOVE LAKE, MONROE COUNTY, W. VA.,
Arizona State Univ., Tempe. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-06214

THE RELATIONSHIPS OF PHOSPHORUS AND NITROGEN TO THE TROPHIC STATE OF NORTHEAST AND NORTH-CENTRAL LAKES AND RESERVOIRS.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-06220

NATIONAL EUTROPHICATION SURVEY METHODS FOR LAKES SAMPLED IN 1972.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-06221

PHYTOPLANKTON BIOMASS AND DISTRIBUTION IN A SHALLOW EUTROPHIC LAKE (LAKE GEORGE, UGANDA),
Vienna Univ. (Austria). Limnologische Lehrkanzel.
For primary bibliographic entry see Field 5C.
W76-06246

N AND P DISTRIBUTION IN LAKE KINNERET (ISRAEL) WITH EMPHASIS ON DISSOLVED ORGANIC NITROGEN,
Israel Oceanographic and Limnological Research Ltd., Haifa; and Kinneret Limnology Lab., Tiberias (Israel).
For primary bibliographic entry see Field 5B.
W76-06268

PRODUCTION OF PLANKTONIC CRUSTACEANS OF TWO SECONDARY OLIGOTROPHIC LAKES, (IN RUSSIAN),
Gorki State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W76-06301

TRANSMISSOMETER MEASUREMENTS OF THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 7B.
W76-06370

WAVE FORCES ON BOTTOM-MOUNTED LARGE-DIAMETER CYLINDER,
Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W76-06395

RELEASE CONTROL POLICY FOR A LARGE LAKE SUBJECT TO WIND WAVES,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W76-06421

DYNAMICS OF MARSH LAND FORMATION AND SUCCESSION ALONG THE LOWER COLORADO RIVER AND THEIR IMPORTANCE AND MANAGEMENT PROBLEMS AS RELATED TO WILDLIFE IN THE ARID SOUTHWEST,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4A.
W76-06589

LAKE LOCATION AND QUALITY AS DETERMINANTS OF POTENTIAL RECREATION BENEFITS: A STUDY OF SELECTED LAKES IN MANITOBA,
Manitoba Univ., Winnipeg, Dept. of Agricultural Economics and Farm Management.
For primary bibliographic entry see Field 6B.
W76-06622

A GUIDE TO WISCONSIN'S LAKE MANAGEMENT LAW.
Wisconsin Univ. Extension, Madison.
For primary bibliographic entry see Field 6E.
W76-06632

LAKE MANAGEMENT CONFERENCE, MAY 12-14, 1975.
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 4A.
W76-06642

LAKE HURON BEGINNING-OF-MONTH WATER LEVELS AND MONTHLY RATES OF CHANGE OF STORAGE,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
F. H. Quinn.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. NOAA TR ERL 348-GLERL 4, GLERL Contribution No. 34, July 1975. 27 p, 6 fig, 15 tab, 1 ref, append.

Descriptors: *Water levels, *Water storage, *Water level fluctuations, Gages, Gaging stations, Height, Lakes, *Lake Huron, Great Lakes, Networks.
Identifiers: Rates of change of storage, Changes of storage, Beginning-of-month water levels, *Gage network.

Results are described of a study of Lake Huron beginning-of-month water levels and monthly changes of storage. The study established that the number and distribution of water level gages in the presently existing gage network is adequate for the computation of beginning-of-month water levels. Computed beginning-of-month water levels and changes of storage for the period 1900-1937 are listed. (NOAA)
W76-06657

OPERATIONAL CHARACTERISTICS OF THE DECCA LAMBDA (6F) POSITIONING SYSTEM OVER FRESH WATER,
Canadian Hydrographic Service, Ottawa (Ontario).
For primary bibliographic entry see Field 7B.
W76-06662

THE EFFECTS OF A BENTHIC GRAZER ON THE PRIMARY PRODUCTIVITY OF THE LITTORAL ZONE OF LAKE TAHOE,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W76-06719

STUDY OF THE STRONTIUM 90/STRONTIUM ISOTOPE BALANCE IN A LATVIAN LAKE, (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5A.
W76-06733

ON THE UNIVERSALITY OF THE POOLE AND ATKINS SECCHI DISK-LIGHT EXTINCTION EQUATION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5A.
W76-06737

PHOTOSYNTHETIC RATES OF PHYTOPLANKTON IN EAST AFRICAN ALKALINE, SALINE LAKES,
Duke Univ., Durham, N. C. Dept. of Zoology.
For primary bibliographic entry see Field 5C.

W76-06742

A TEMPERATURE-STRESSED STREAM ECOSYSTEM BELOW A HYPOLIMNIAL RELEASE MOUNTAIN RESERVOIR,
Colorado State Univ., Fort Collins. Dept. of Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W76-06743

A STUDY OF THE BENTHIC MACRO-INVERTEBRATES OF A SHALLOW EUTROPHIC RESERVOIR IN SOUTH WALES WITH EMPHASIS ON THE CHIRONOMIDAE (DIPTERA); THEIR LIFE HISTORIES AND PRODUCTION,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 5C.
W76-06747

THE BACTERIAL COMPOSITION, AND THE METABOLIC ACTIVITY OF SOME PHYSIOLOGICAL GROUPS OF BACTERIA IN TWO GRAVEL PIT LAKES,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Limnologisches Institut.
For primary bibliographic entry see Field 5C.
W76-06749

OWASCO LAKE AND ITS WATERSHED, A SUMMARY REPORT WITH TWO APPENDICES AND MAPS,
Cornell University, Ithaca, N. Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W76-06751

HYDROGRAPHICAL FEATURES OF NORDBYTJERNET, A MANGANESE-RICH MEROMICTIC LAKE IN SE NORWAY,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-06752

NEUTRON ACTIVATION ANALYSIS OF SOME OF THE BIOLOGICALLY ACTIVE TRACE ELEMENTS IN FISH,
Pennsylvania State Univ., University Park, Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5A.
W76-06753

OBSERVATIONS AND EXPERIMENTS ON THE PHYTOPLANKTON OF BLELHAM TARN, ENGLISH LAKE DISTRICT I. THE EXPERIMENTAL TUBES,
For primary bibliographic entry see Field 5C.
W76-06758

A NATURAL HISTORY STUDY OF THE VASCULAR FLORA OF CEDAR BOG, CHAMPAIGN COUNTS, OHIO,
Urbana Coll., Ohio. Div. of Scientific Mathematics.
C. M. Frederick.
Ohio J Sci. 74(2), p65-116, 1974.

Descriptors: *Bogs, Vegetation, Ohio, Trees, Climates, Weather, Swamps, Distribution, Temperature.
Identifiers: Mad River(Ohio), Cedar bog.

Cedar Bog Nature Preserve is a relict boreal bog situated in the Mad River valley in Champaign County, west-central Ohio. Originating following the retreat of the Wisconsin glacier, it has been maintained by the combination of a usually cool moist microclimate and a uniform flow of cool ground water. Microclimatic data recorded from 1963 through 1969 demonstrate that Cedar Bog has cooler temperatures and a shorter frost-free period than do adjoining areas. These 2 factors have resulted in the survival of plants unique to this part of Ohio. Within the Bog area, 6 major plant associations have been identified-the bog meadow, marl meadow, arbor vitae, swamp forest, hardwood forest and shrub associations. The marl meadow (the wettest area) lies in the northeast section, with the bog meadow and arbor vitae associations south of it, the swamp forest occurring adjacent to the arbor vitae, on the west and the hardwood forest lying beyond the swamp forest. A total of 546 taxa of vascular plants was identified in the Bog; this list is presented, together with information on occurrence, abundance, and whether or not the species has been reported earlier. Of these taxa, 173 were previously unreported for Cedar Bog, whereas twenty-one with earlier documented occurrences are now apparently extinct in the Bog. --Copyright 1975, Biological Abstracts, Inc.
W76-06760

VEGETATION CHANGES IN A SMALL MICHIGAN BOG FROM 1917 TO 1972,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
C. R. Schwintzer, and G. Williams.
Am Midl Nat. 92(2), p 447-459, 1974.

Descriptors: *Bogs, *Vegetation, Trees, Weather, Climates, Flooding, Michigan, Mortality.
Identifiers: Chamaedaphne, Bryants bog(Mich).

Quantitative descriptions of the vegetation and maps of the pool of Bryant's Bog are available for several years since 1917. The vegetation advanced into the bog pool in an irregular manner at an average rate of 2.1 cm/yr. In 1972 the pool was 76% of its extent in 1926. The vegetation changed in a successional series from the Chamaedaphne association of 1917 to the high bog-shrub association in the dry years of the 1920's to a bog forest which was well established in the late 1960's. It regressed in the early 1970's when many of the trees died and the Chamaedaphne association appeared to be re-establishing itself. The most probable cause of tree mortality was flooding caused by exceptionally high water levels due to natural weather cycles. Tree mortality was also found in Hoop Lake Bog-which, like Bryant's Bog, lacks aboveground drainage-while none occurred in bogs with above ground drainage.--Copyright 1975, Biological Abstracts, Inc.
W76-06761

LAKE ELLESMERE, CANTERBURY, NEW ZEALAND: A REVIEW OF THE LAKE AND ITS CATCHMENT,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Ecology Div.
For primary bibliographic entry see Field 5C.
W76-06762

ICTALURUS NEBULOSUS (LE SUEUR, 1819) IN A LAKE BIOCENOSIS, (IN POLISH),
Akademia Rolnicza, Lublin (Poland). Instytut Biologii.
L. H. Adamczyk.
Przegl Zool 19(1), p 71-73, 1975.

Descriptors: Lakes, *Bullheads, Fish.
Identifiers: *Biocenosis(Lakes).

The changes in a lake biocenosis after the invasion of I. nebulosus (Le Sueur, 1819) are described.--Copyright 1975, Biological Abstracts, Inc.
W76-06765

CHLOROPHYLL A CONTENT AS AN INDEX OF PERIPHYTON PRODUCTIVITY, EXEMPLIFIED BY LAKE KRASNOE, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W76-06772

THE MICROFLORA OF AEROBIC BACTERIA IN GRAVEL PIT LAKES, (IN GERMAN),
Sueddeutsche Versuchs- und Forschungsanstalt fuer Milchwirtschaft, Weihenstephan (West Germany). Bakteriologisches Institut.
For primary bibliographic entry see Field 5C.
W76-06777

HORIZONTAL DISTRIBUTION OF ZOOPLANKTON IN THE MINGECHAUR RESERVOIR, (IN RUSSIAN),
I. A. Akhmedov.
Izv Akad Nauk Az SSR ser Biol Nauk 5-6, p 106-111, 1974.

Descriptors: Zooplankton, Reservoirs, Distribution patterns, Spatial distribution, Algae, Fish.
Identifiers: Azerbaijan-SSR, *USSR(Mingechaur Reservoir).

Investigations in 1965-1970 established that a number of species of zooplankton have a wide horizontal distribution in the Mingechaur Reservoir on the Kura River in the Azerbaidzhan SSR (USSR). In the upper stretch of the reservoir 26 spp. were found; in the middle stretch, 29 spp.; in the lower stretch, 25 spp.; and in the Khanabad stretch near the dam, 15 spp. The seasonal distribution of zooplankton in the reservoir has 2 phases: winter and spring, with maximum biomass in the middle stretch and the minimum in the lower and Khanabad stretches, and summer and fall, with maximum development in the upper stretch. The nonuniform distribution of zooplankton in the reservoir depends on the water level, transparency, thermal regime, wind direction, current velocity, development of algae and consumption of zooplankton by fish.--Copyright 1975, Biological Abstracts, Inc.
W76-06780

VEGETATION IN LAKE TAMNAREN: INTERPRETATION OF AERIAL PHOTOS AND DESCRIPTION OF THE VEGETATION, (IN SWEDISH),
Uppsala Univ. (Sweden). Inst. of Limnology.
M. Wallsten.
Sven Bot Tidskr 68(4); p 431-440, 1974.

Descriptors: *Remote sensing, Aerial photography, Lakes, *Vegetation, *Distribution, Aquatic plants.
Identifiers: Elodea-Canadensis, Macrophyte, Nuphar-Luteum, Phragmites-communis, Potamogeton-Natans, Scirpus-Lacustris, *Sweden(Lake Tamnaren).

Lake Tamnaren, a shallow lake with an average depth of 0.9 m and a maximum depth of 1.8 m, is situated about 65 km NNW of Uppsala central Sweden. The area of the lake is 38 km2, of which L. Sorsjon, and almost separated bay, occupies 3 km2. The surface of L. Tamnaren was lowered in 1875 and 1950, resulting in a level 1.5 m below the original. This has caused a vigorous growth of the vegetation. Aerial photography of the lake was carried out in the summer of 1973 and mapping done with the help of the pictures. Each stand of vegetation was dominated by a single species. Phragmites communis Trin, and Scirpus lacustris L. were the most common species along the shores. Towards the middle of the lake these stands were succeded by a belt of floating-leaved vegetation with Nuphar luteum (L.) Sm. and Potamogeton natans L. The distribution areas of the plants were measured using a photoelectric method. The total area of the aquatic macrovegetation is 30.7 km2, which means that all of L. Sorsjon and 79% of L. Tamnaren were covered with vegetation. It was not possible to record sparsely scattered plants and submerged vegetation. In some parts Elodea canadesis Michx. was very abundant.
W76-06781

CONTINUOUS CULTURES APPLIED TO ECOLOGICAL RESEARCH, (IN FRENCH),
Institut National de la Recherche Agronomique, Thonon-les-Bains (France). Station d'Hydrobiologic Lacustre.
For primary bibliographic entry see Field 5C.
W76-06782

STUDY OF THE PHOSPHATE METABOLISM OF A DRINKING WATER RESERVOIR, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-06785

2I. Water In Plants

THE ORIGIN AND DEVELOPMENT OF WATERLOGGED MEADOWS IN THE CENTRAL PART OF THE SUMAVA FOOTHILLS,
Ceskoslovenska Akademie Ved, Brno. Botanicka Ustav.
K. Rybnicek, and E. Rybnickova.
Folia Geobot Phytotaxon. 9(1): 45-70. 1974.

Descriptors: *Europe, Lakes, Sediments, *Grasslands, Biological communities, Ecology, Plant populations, Profiles, Distribution patterns.
Identifiers: Czechoslovakia, Foothills, Lake Holocene, Meadows, Lake Flandrian, Sumava.

The paleoecological investigation of the meadows (Czechoslovakia) is based on the macroscopic analyses, completed with pollen analyses, of Late Holocene (Lake Flandrian) sediments in 5 profiles. It is suggested that, in the course of the last 600-700 yr, the meadows developed as a secondary plant community, replacing original alder stands, due to the activity of man in the area; they usually passed through seminatural meadow types to the present cultivated stands. In addition to detailed descriptions of local successions on various sites, the study presents some general conclusions concerning the cenotic and synecological adaptability of some plants, discusses the development of plant communities and their changes in time.--Copyright 1974, Biological Abstracts, Inc.
W76-06247

WATER RELATIONS OF SELECTED SPECIES OF CHAPARRAL AND COASTAL SAGE COMMUNITIES,
San Diego State Univ., Calif. Dept. of Biology.
For primary bibliographic entry see Field 3B.
W76-06259

SEED GERMINATION, RESPIRATION AND MITOCHONDRIAL EFFICIENCY OF THREE ALFALFA (MEDICAGO SATIVA L.) CULTIVARS SUBJECTED TO NACL SALINITY,
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
For primary bibliographic entry see Field 3C.
W76-06264

EFFECT OF SALINE WATER IRRIGATION ON N.CO310 AND H50-7209 CULTIVARS OF SUGARCANE: II. CHEMICAL COMPOSITION OF PLANTS,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 3C.
W76-06274

THE DISTRIBUTIONAL ECOLOGY AND DIVERSITY OF BENTHIC INSECTS IN CEMENT CREEK, COLORADO,
Maryland Univ., College Park. Md. Dept. of Zoology.
J. D. Allan.
Ecology, Vol. 56, No. 5, p 1040-1053, Late Summer, 1975. 9 fig, 8 tab, 54 ref.

Descriptors: *Ecological distribution, *Spatial distribution, Benthic fauna, Streams, *Ecotypes, *Aquatic insects, Ecology, Biological communities, Predation, Water temperature, Biota, Environmental gradient, *Colorado, Elevation.
Identifiers: *Cement Creek(Colo), Diversity, *Benthic insects.

Streams exhibit longitudinal zonation in such factors as temperature, current, substratum, and biota. Several levels of spatial scale were studied in the alpine stream Cement Creek in Gunnison County, Colorado. Faunal replacement did not appear to be affected by ecotones including zonation in terrestrial vegetation and trout distribution, but did seem to be associated with gradual changes in the physical gradient. Trout zonation may affect total number of insects, as the trout-free headwaters had two to six times higher insect densities. Investigation of microdistribution led to the hypothesis that increased substratum complexity leads to greater species richness based on several lines of evidence: (1) different species showed different substratum preferences, (2) colonization of mixed substrata generally resulted in greater mean species richness than did colonization of a single substratum type, and (3) both species diversity and substratum complexity were greatest at the within-microhabitat level. Substratum composition showed little variation along the elevational gradient and did not appear to be a cause of faunal replacement. (Robinett-Arizona)
W76-06587

SALTCEDAR (TAMARIX CHINENSIS) SEED PRODUCTION, SEEDLING ESTABLISHMENT, AND RESPONSE TO INUNDATION,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 3B.
W76-06590

LOCALIZATION OF DAMAGE INCURRED DURING WATER IMBIBITION BY PISUM SATIVUM AND ZEA MAYS SEEDS, AS REVEALED BY THE TOPOGRAPHIC TETRAZOLIUM TEST,
Scottish Horticultural Research Inst., Invergowrie.
J. G. Harrison.
Hortic Res. 13(2/3), p 119-124, 1973.

Descriptors: *Seeds, *Root zone, *Corn(Field), Inhibition, Plant physiology.
Identifiers: *Pisum-Sativum, *Tetrazolium test.

Damage incurred when seeds of P. sativum L. and Z. mays L. were soaked in water reduced their viability. More died after imbibition at 1 C than after embibtion at 20 C. The standard topographic tetrazolium test showed that loss of viability was associated with death of the root and shoot tips of the embryo.--Copyright 1974, Biological Abstracts, Inc.
W76-06649

INLAND WATERS, SPECIFIC PRESENTATIONS FROM LIMNOLOGY AND RELATED FIELDS, VOL. 27. THE REED PHRAGMITES COMMUNIS TRINIUS, (IN GERMAN),
L. Rodewald-Rudescu.
302 p. E. Schweizerbart'sche Verlagsbuchhandlung: Stuttgart, West Germany. 1974.

Descriptors: *Reeds, *Inland waterways, imnology, Systematics, History, Plant physiology, Publications, Distribution, Drought, Aquatic plants, Microorganisms.
Identifiers: *Phragmites-Communis.

The general systematics, distribution, history, morphology and macro- and micro- scopic anatomy of reeds are discussed. Development, reproduction, O2 supply, water and material balance and resistance to cold, drought and salt are also covered. Then climate, soil and water microbiology and chemistry, flora and fauna of Phragmites crops, chemical properties with respect to paper production and classification according to biotype are discussed. Finally, methods of reed cultivation, nutrient solutions, morphological, anatomical and physiological changes due to cultivation, mechanical harvesting, storage, damage and the broad significance of reeds in industry are examined. --Copyright 1975, Biological Abstracts, Inc.
W76-06741

WATER PLANTS OF THE WORLD. A MANUAL FOR THE IDENTIFICATION OF THE GENERA OF FRESHWATER MACROPHYTES,
C. D. K. Cook, B. J. Gut, E. M. Rix, J. Schneller, and M. Seitz.
561p. Dr. W. Junk b.v., Publishers: The Hague, Netherlands. 1974.

Descriptors: *Aquatic plants, Publications, Ecology, Reproduction, *Algae.
Identifiers: Bryophyta, Charophyta, *Macrophytes, Pteridophyta, Spermatophyta.

The Charophyta, Bryophyta, Pteridophyta and Spermatophyta whose photosynthetically active parts are located in freshwater are covered; marine and exclusively brackish water plants are not. Keys to the families based on reproductive features and keys to the genera based on vegetative structures are provided. Most of the text consists of the genera descriptions including morphology, distribution, number of species and ecology. References and synonymies are also included. All genera are illustrated by line-drawings. A glossary and an index to the families and genera are provided. --Copyright 1975, Biological Abstracts, Inc.
W76-06745

ESTIMATION OF THE TOTAL EVAPORATION OF EXPERIMENTAL OBJECTS IN CLIMATIC CHAMBERS, (IN BULGARIAN),
Academy of Agricultural Sciences, Sofia (Bulgaria). Central Lab. for Agrophysical Investigations.
For primary bibliographic entry see Field 2D.
W76-06766

PHYTOSOCIOLOGICAL STUDIES OF AQUATIC AND MARSH VEGETATION IN MORE OG ROMSDAL, WESTERN NORWAY, (IN NORWEGIAN),
For primary bibliographic entry see Field 2L.
W76-06767

THE 'RHEINSCHNAKEN' (DIPTERA, CULICIDAE) SPECIES, LIFE STYLE, ECOLOGY, MASS DEVELOPMENT, AND CONTROL, (IN GERMAN),
Freie Universitaet Berlin (West Germany). Institut fuer Angewandte Zoologie.
F. Peus.
Z Ange W Zool 62 (2), p 231-242, 1975.

Descriptors: Diptera, Europe, Ecology, Rivers, Forests, *Mosquitoes, Regions.
Identifiers: Aedes-sticticus, Aedes-vexans, *Culicidae, Rheinschnaken, *Rhine River(W Germany).

The regional expression 'Rheinschnaken' refers to the Aedes vexans and A. sticticus which occasionally occur in large numbers in the lowland forests along the upper Rhine river (West Germany). The large stagnant pools of water formed by stopping off older sections of the river and those formed in the natural basins in the forests are the main breeding areas. The annual cycle of these mosquitoes corresponds closely to the hydrological events in the lowland forests. Floods in spring and midsummer produce 2 generations. The higher the ground water level, the greater the

number of eggs developed. The older sections of the river should be re-integrated into the main stream and the forest basins should also be connected with the river via canals. These measures are preferable to chemical control since no immunity develops and there is no further pollution. The use of repellents is recommended for anyone staying in the area. Large swarms of harmless Chironomidae are often mistaken for mosquitoes by laymen and light traps are somewhat successfully used against them but these are mostly ignored by the mosquitoes.--Copyright 1975, Biological Abstracts, Inc.
W76-06768

EFFECTS OF SOIL MOISTURE ON GROWTH OF JAPANESE RABDOSIA, (IN JAPANESE),
N. Kurosaki.
Acta Phytotaxon Geobot 26(3/4), p 89-95, 1974.

Descriptors: *Soil moisture, *Growth rates, Growth stages.
Identifiers: *Rabdosia, Rabdosia-effusa, Rabdosia-inflexa, Rabdosia-janponica, Rabdosia-longituba, Rabdosia-shikokiana, Rabdosia-trichocarpa, Rabdosia-umbrosa, *Japan.

Seven species of Rabdosia (R. effusa, R. inflexa, R. japonica, R. longituba, R. shikokiana, R. trichocarpa, R. umbrosa) were studied. Growth was measured by shoot length, number of nodes/and leaf size for each cultivation of 53-55 days after the germination. For every species except R. japonica, response was similar. The optimum soil moistures were 60% and 80% of maximum water capacity. When cultivated with 40% and 100% water supply, growth was distinctly reduced, and on media with 20% water supply the plants became stunted or often died. In R. japonica, the range of optimum soil moisture was 40%-80%. On the media with 20% and 100% water growth was poor. Compared with the vicarious varieties restricted to the Pacific Ocean side, those of Japan Sea elements, R. shikokiana var. occidentalis and R. umbrosa var. hakusanensis, tended to have maximum growth on media somewhat higher in soil moisture (80%).--Copyright 1975, Biological Abstracts, Inc.
W76-06771

OPTIMAL DISTRIBUTION OF ASSIMILATES DURING LIMITED WATER SUPPLY: A MATHEMATICAL MODE, (IN RUSSIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Institut Fiziki i Astronomii.
K. Moldau.
Eesti Nsv Tead Akad Biol 24(1); p 3-9, 1975.

Descriptors: *Water supply, *Mathematical models, Optimization, *Distribution patterns, Roots, Leaves, *Growth rates, *Reproduction.

For every soil and atmospheric humidity value there exists an optimal distribution of assimilates between roots and leaves which ensures the maximum rate of assimilation in leaves. With a constant growing period and constant water deficit the maximum reproductive yield is guaranteed by sharp transition from vegetative to reproductive growth in an optimal time. Under water stress the optimal length of the reproductive growth period is increased. At maximum reproductive yield the ratio of reproductive mass to the whole biomass of plant is 0.5, irrespective of water deficit and length of the growing period. The model allows some phenomena of plant adaption of water deficits to be demonstrated.--Copyright 1975, Biological Abstracts, Inc.
W76-06786

RELATIONSHIP BETWEEN PLANT RESPIRATION AND WATER METABOLISM, (IN RUSSIAN),
Tashkent Agricultural Inst. (USSR).
A. I. Razmaev.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina 4, p 21-22, 1974.

Descriptors: *Respiration, *Plant physiology, *Metabolism, Equations, *Carbon dioxide production, Temperature, Equations.

Analytic treatment of basic plant catabolism ($RCOOH + 02 = CO2 + H2O = 2$) is presented providing equations describing the dynamics of CO2 production in respect to temperature and correlating CO2 production with the dynamics of water accumulation and transpiration in plant cells to the limit of plant death. The final equation derived suggests that temperature fluctuations within ordinarily encountered limits determine the duration of plant vegetation.--Copyright 1975, Biological Abstracts, Inc.
W76-06789

EFFECTS OF ANTITRANSPIRANTS ON DISTRIBUTION AND UTILIZATION OF PHOTOSYNTHATE IN PINUS RESINOSA SEEDLINGS,
Ibadan Univ. (Nigeria). Dept. of Botany.
M. O. Olofinboba, T. T. Kozlowski, and P. E. Marshall.
Plant Soil. 40(3), p 619-635, 1974.

Descriptors: *Antitranspirants, *Distribution patterns, *Pine trees, *Seedlings, Sprays.
Identifiers: Carbon-14, Folicote, Keykote, *Photosynthate.

Three-year-old P. resinosa Ait. seedlings were exposed to C14O2 24 h after application of Aqua Gro, CS 6432, or Wilt Pruf antitranspirants; more activity was recovered from treated seedlings than from control seedlings 1 day after exposure to C14O2. However, less activity was recovered when seedlings were exposed to C14O2 11 days after treatment with any antitranspirant except Clear Spray. Clear Spray, Folicote and Keykote reduced accumulation of photosynthate, but their effects diminished with time. They also reduced the rate of loss of currently produced photosynthate, with the utilization effect most pronounced in Folicote-treated seedlings. All antitranspirants tested, except Aqua Gro and CS 6432, initially reduced the rate of conversion of labelled photosynthates into ethanol-insoluble components when treated seedlings were exposed to C14O2 24 h after antitranspirant application. More labelled ethanol-insoluble components were recovered from antitranspirant-treated seedlings than from controls 14 days after exposure of seedlings to C14O2. The type of spray, time between antitranspirant application and exposure to C14O2, as well as the time between exposure and seedling harvest, has significant effects on C14 assimilation and redistribution of soluble and insoluble assimilates in various plant parts. Many of the observed effects may not have been directly due to the antitranspirants alone but may have been secondary effects caused by antitranspirant-induced changes in photosynthesis and plant water balance.--Copyright 1974, Biological Abstracts, Inc.
W76-06792

FLOODING EFFECTS ON LIGHT REFLECTANCE, TRANSMITTANCE, AND ABSORPTANCE OF COTTON (GOSSYPIUM HIRSUTUM) LEAVES,
Agricultural Research Service, Weslaco, Tex.
R. R. Rodriguez, and H. W. Gausman.
J Rio Grande Val Hortic Soc. 27, p 81-85, 1973.

Descriptors: *Flooding, *Cotton, *Leaves, *Light, Crop production, Aerial photography, Remote sensing.
Identifiers: *Chlorophyll deficiency.

Leaves from cotton plants flooded for 14 days became yellow (chlorophyll deficient), and their light reflectance was increased in the visible wavelength region (500 to 750 nm) compared with the green leaves of nonflooded plants. This change in reflectance might provide a basis for the remote sensing (aerial photography or multispectral scanner) determination of flood damage to crops after heavy rains.--Copyright 1974, Biological Abstracts, Inc.
W76-06794

INFLUENCE OF WATER STRESS AND GROWTH REGULATOR APPLICATIONS ON SUGAR COMPOSITION OF SOYBEAN LEAVES,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
J. T. Cothren, and C. A. Stutte.
Phyton Rev Int Bot Exp. 31(2), p137-143, 1973.

Descriptors: Soybeans, Leaves, Plant physiology, Chromatography, Growth rates, Fertilizers, Crop production.
Identifiers: Chromatography, Fructose, Glucose, Hydrofurfuryl, Phosphonium, Sucrose, Sugar.

Sugars extracted from soybean leaves treated with either tributyl (5-chloro-2 thienyl) phosphonium chloride or tetrahydrofurfuryl isothiocyanate were assayed for total sugar concentration and composition. Total sugars were estimated colorimetrically while glucose, fructose, and sucrose were determined by gas and thin layer chromatography. Chemical treatments under controlled environmental conditions resulted in a decreased relative percentage composition of glucose and frucose and an increase in sucrose. The total sugar concentration in the leaves of field grown 'Davis' soybeans decreased with tetrahydrofurfuryl isothiocyanate treatment. As with the environmentally controlled plants, the relative percentage of glucose and fructose decreased with sucrose increased. This increased relative percentage of sucrose paralleled seed yield increases of 20% in water stressed plants and 15% in the non-water stressed plants when they were chemically treated. There was 118% seed yield increase in 'Davis' soybeans which were irrigated and chemically treated as compared to water stressed, nontreated plants. --Copyright 1974, Biological Abstracts, Inc.
W76-06796

2J. Erosion and Sedimentation

FORMATION OF WATER AND SEDIMENT DISCHARGE DURING THE SPRING FLOOD ON A SLOPE AND IN A SMALL GULLY-RAVINE DRAINAGE BASIN,
N. I. Drozd, Z. A. Goretskaya, and P. A. Shkryabiy.
Soviet Hydrology Selected Papers, No. 3, p 154-160, 1974. 2 fig, 3 tab. Translated from Transactions of the State Hydrologic Institute (Trudy Gossudarstvennogo Gidrologicheskogo Instituta), No. 210, p 31-39, 1974.

Descriptors: *Runoff, *Erosion, *Sediments, *Snowmelt, Ravines, Gullies, Melt water, Suspended solids, Discharge(Water), Discharge measurement, Snow, Spring, Precipitation(Atmospheric), Sediment discharge, Basins, Watersheds(Basins).
Identifiers: *USSR, *Dnieper River(USSR).

Water erosion produced by meltwater runoff from slopes and small drainage basins of the gully-ravine type is severe in the hills on the right bank of the Dnieper River. Spring runoff is variable and even discontinuous in the course of the day and in individual periods of snow melting. Peak discharges are relatively low, but of considerable volume, frequently exceeding that of flood runoff by many factors. The variations and characteristics of runoff from two elementary drainage basins during the spring flood of 1969 were examined. Water runoff was measured by weirs at the outlet gaging stations of the ravines. The water was sampled for its suspended particle concentra-

tion from two to six times a day, mainly in the afternoon. Precipitation, snow depth, the water equivalent of snow, soil freezing, and soil moisture to a depth of 1.0-1.5 m were measured in the drainage basins. The values of the liquid and solid components of runoff varied throughout the spring not only from day to day, but also in the course of the day. The highest hourly runoff was observed in the afternoon, from 12-13 to 17-18 h. The irregularity of meltwater runoff and of sediment discharge in the course of a spring must be taken into account in computing the volume and filtration capacity of earthen erosion control structures. (Sims-ISWS)
W76-06176

SEDIMENT RESERVOIRS IN THE CHANNELS OF SMALL MOUNTAIN RIVERS,
K. F. Artamonov, A. N. Kroshkin, and N. N. Bystrov.
Soviet Hydrology, Selected Papers, No. 3, p 210-213, 1974. 2 fig, 1 tab, 4 ref. Translated from (Hydraulic Engineering and Reclamation), Gidrotekhnika i melioratsiya, No. 6, p 34-37, 1974.

Descriptors: *Sediments, *Suspended solids, *Rivers, Erosion, Sedimentation, Bed load, River beds, Channels, Mountains, Discharge(Water), Sediment discharge.
Identifiers: *Sediment reservoirs.

Sediment reservoirs on small mountain rivers are an effective means for retaining bed-load and partly of suspended load under high sediment discharge conditions. A complex method of computing the silting of the headrace with separate consideration of the formation of the cones of bed- and suspended-load deposits in the zone of the backwater curve is best suited for computing sediment reservoirs in the mountainous reaches of rivers with a bedload discharge of more than 20-30% of total annual solid discharge. In addition to the organization of quarries of construction material in the headrace, an important measure for increasing the service time of a sediment reservoir (in the presence of outlet discharges and the possibility of completely lowering the water level) is washing of the sediment deposits. The effectiveness of washing increases when bed load is retained in small and the suspended load in large sediment reservoirs. To prevent general and local deformations in the trailrace, the threshold of the outlet opening must be raised above the average level of the river flood plain, the foundations of the cut-off wall must be deepened, and the outlet channel must be regulated. (Sims - ISWS)
W76-06177

SOME CHARACTERISTICS OF THE PROCESS OF INCOMPLETE MEANDERING OF THE CHANNEL OF THE UPPER OB' RIVER,
For primary bibliographic entry see Field 4A.
W76-06178

OPTIMUM DREDGED DEPTH IN INLAND WATERWAY,
CACI, Inc., Arlington, Va.
A. B. Hochstein.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 101, No. WW4, Proceedings Paper 11698, p 331-342, November 1975. 4 fig, 2 tab, 4 ref, 2 append.

Descriptors: *Barges, *Channels, *Dredging, Hydrology, Optimization, Open channel flow, Transportation, *Inland waterways, Networks, Rivers, Water levels, Locks, River beds, Economics.
Identifiers: *Channel stabilization, *Waterways, Economic analysis, Tow industry, Optimal channel depth, Economic estimates.

Criteria for optimum depths in the inland waterway network is minimized value of the sum: cost of tow industry plus cost of waterway structures, in the open rivers mainly cost of dredging. Volume of dredging is estimated by use of the relationship between the most important hydrological and morphological parameters that determine the degree of stability of the riverbed. If extensive dredging is planned, it is necessary to take into account change of hydraulic parameters of the river that will be followed by a lowering of the water level and depths in channels. In the reaches of open river with sufficient large seasonal oscillation of water levels, it is important to calculate the average usable (seasonal or annual) depth and draft on the base of the relationships between water level and controlling depth. The plan described represented a simple solution to the problem of optimal channel depth, useful for planning purposes and economic estimates. (Roberts - ISWS)
W76-06182

SEDIMENTS EXPOSED ON THE SURFACE OF THE ROSS ICE SHELF, ANTARCTICA,
Nebraska Univ., Lincoln. Ross Ice Shelf Project.
For primary bibliographic entry see Field 2C.
W76-06188

DEPOSITIONAL MODELS AND THE SHINARUMP MEMBER AND THE SONSELA SANDSTONE BED OF THE CHINLE FORMATION NORTHEASTERN ARIZONA AND NORTHWESTERN NEW MEXICO,
Arizona Univ., Tucson. Dept. of Geosciences.
A. S. Trevena.
Master of Science Thesis, 1975, 162 p, 43 fig, 12 tab, 74 ref, 4 append.

Descriptors: *Streambeds, *Geomorphology, *Deposition(Sediments), *Model studies, *Geologic formations, Geology, Streams, Sedimentation, Braiding, Graded, Arizona, New Mexico, Beds(Stratigraphic), Fluvial sediments, Rivers, Sediments, Sandstones, Paleohydrology, History.
Identifiers: *Chinle Formation(Ariz - N Mex).

Modern stream deposits are the key to recognizing the distribution of ancient fluvial environments for a better understanding of paleogeography and paleotechtonics. Studies in north eastern Arizona and northwestern New Mexico confirm a stream channel origin for the Shinarump Member and the Sonsela Sandstone Bed of the Chinle Formation and show that streams of diverse channel patterns were present in this region during the Late Triassic. In this paper, three stream channel models are developed from published reports of present-day fluvial sedimentation: (1) abundant horizontally stratified and/or structureless coarse sandstone to conglomerate indicate a bed-load, braided stream model; (2) trough cross-stratified sandstone that becomes finer-grained upward characterizes the suspended-load meandering stream model; and (3) streams of intermediate channel pattern are typified by abundant tabular-planar cross-stratification, trough cross-stratification, and horizontal stratification. This study also indicates that reports of present day fluvial deposits and controlled laboratory flume studies can be used to interpret flow conditions of ancient streams. (Robinett-Arizona)
W76-06258

SEDIMENT DATA, CANADIAN RIVERS 1972.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
For primary bibliographic entry see Field 7C.
W76-06376

AN INVESTIGATION OF SUSPENDED MATERIAL CONCENTRATIONS IN EASTERN LONG ISLAND SOUND,
Connecticut Univ., Groton. Dept. of Geology; and Connecticut Univ., Groton. Marine Sciences Inst.
For primary bibliographic entry see Field 2L.
W76-06381

SOLUTION CHEMISTRY, MASS TRANSFER, AND THE APPROACH TO CHEMICAL EQUILIBRIUM IN POROUS CARBONATE ROCKS AND SEDIMENTS,
Illinois Univ., Urbana. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W76-06384

INITIATION OF BED FORMS AND MEANDERS IN COARSE-GRAINED SEDIMENT,
University Coll. of Wales, Aberystwyth. Dept. of Geography.
Geological Society of America Bulletin, Vol. 87, No. 2, p 281-285, February 1976. 6 fig, 1 tab, 24 ref.

Descriptors: *Meanders, *Fluvial sediments, *Channel erosion, River training, *Geomorphology, Streambeds, Sediment transport, On-site investigations, Hydraulics, Flow rates, Bank erosion.
Identifiers: *Bed forms, *River Ystwyth(Wales), Pseudo-meandering model.

Some field observations pertinent to the role of point-bar formation in meander development were reported. Observations were carried out on the River Ystwyth in Wales. Part of the river was artificially straightened in 1864 and restraightened in 1969. The field observations showed that in a straight plane-bed channel in coarse sediment under natural flow conditions, primary transverse bars were rapidly formed during infrequent high flows, and the accompanying flow modifications led to bank erosion. Primary bars were subsequently incorporated as the cores of point-bar complexes, with additional lateral and tail accretion, chute formation, and lesser erosional and sedimentary modifications. The range of natural flows produced a variety of bed forms; therefore, the channel form at any point in time was not strictly attributable to any single controlling discharge, but the broad features of channel development in general relate to the forms of the pseudo-meandering model. A three-phase model of meander development, with these observations exemplifying the first phase, is adequate and useful. (Singh - ISWS)
W76-06385

EROSION ON THE LINE ISLANDS ARCHIPELAGIC APRON: EFFECT OF SMALL-SCALE TOPOGRAPHIC RELIEF,
Scripps Institution of Oceanography, San Diego. Marine Physical Lab.
For primary bibliographic entry see Field 2L.
W76-06386

LOESS IN OHIO IN RELATION TO SEVERAL POSSIBLE SOURCE AREAS: I. PHYSICAL AND CHEMICAL PROPERTIES,
Ohio State Univ., Columbus. Dept. of Agronomy.
E. M. Rutledge, N. Holowaychuk, G. F. Hall, and L. P. Wilding.
Soil Science Society of America Proceeding, Vol. 39, No. 6, p 1125-1132, November-December 1975. 5 fig, 3 tab, 25 ref.

Descriptors: *Loess, *Ohio, *Valleys, Geomorphology, *Chemical properties, *Physical property, Particle size, Soil formation, Paleosols, Age, On-site investigations, Chemical analysis, Distance, Soil profiles, Silts, Clays, Soil horizons.
Identifiers: Source areas, *Little Miami River(Ohio), *Scioto River(Ohio), *Muskingum River(Ohio), Peoria loess, Roxanna silt, Loveland silt, Sangamon paleosol, Multiple deposits, Fine earth criterion, Clay-free criterion, Pedogenic data, Alfisols.

Thin loess deposits east of the Little Miami, Scioto, and Muskingum rivers in Ohio were in-

vestigated (1) to test the hypothesis that these river valleys were source areas for the loess that adjoins them, (2) to determine if multiple loess strata occurred within any of the loess deposits, and (3) to approximate, where possible, the geologic age of the loess. The loessial materials were investigated using morphological, chemical, and physical parameters. Particle-size data were expressed on a fine earth and clay-free basis. The fine earth basis was useful in detecting pedogenic development. Clay-free data were used in establishing changes in parent material with depth and, perhaps more importantly, in development of relations between particle-size and distance from proposed source areas. Scioto and Muskingum river valleys were the chief source areas for the loess in the adjoining study areas, but the Little Miami Valley was not the primary source of the loess in the study area adjacent to it. Multiple loess deposits were identified only adjacent to the Muskingum River. All upper loess units were considered to be of comparable age: Late Wisconsin (Peoria Loess). The middle loess adjacent to the Muskingum River was considered to be Farmdale (Roxanna Silt) and the lower loess at the same site was considered to be Loveland loess (Loveland Silt) and contained a well-developed Sangamon paleosol. (See also W76-06400) (Visocky-ISWS)
W76-06399

LOESS IN OHIO IN RELATION TO SEVERAL POSSIBLE SOURCE AREAS: II. ELEMENTAL AND MINERALOGICAL COMPOSITION,
Ohio State Univ., Columbus, Dept. of Agronomy.
E. M. Rutledge, L. P. Wilding, G. F. Hall, and N. Holowaychuk.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1133-1139, November-December 1975. 2 fig, 1 tab, 11 ref.

Descriptors: *Loess, *Ohio, *Mineralogy, *Weathering, Soil horizons, Clays, Silts, Soil formation, Particle size, Clay minerals, Calcium, Iron, Potassium, Titanium, Soil profiles, Depth, Paleosols, Quartz, Kaolinite, On-site investigations, Chemical analysis.
Identifiers: *Clay fractions, *Muskingum River(Ohio), *Little Miami River(Ohio), *Scioto River(Ohio), Mica, Vermiculite, Zirconium.

This study presents the elemental and mineralogical composition of thin loessial deposits eastward of three rivers in Ohio. In general, elemental contents (Ca, Fe, K, Ti, and Zr) of medium and coarse silts of the Late Wisconsin-age loesses were of the same magnitude in each area. These elements show remarkably slight weathering profiles which were essentially comparable among areas. Weathering profiles of Fe were more strongly expressed than those of K and Ca depth-distribution of Zr and Ti were most uniform. Contents of Ca within a Loveland loess paleosol were remarkable constant in depth and notably low, especially in the coarse silt fraction (mean of 0.06%). Mineralogy did not reflect bedrock lithologies among the different assumed loess areas. Clay fractions from the parent loess in the first two transects were dominated by mica followed by vermiculite and quartz with less expandable and kaolinite. Clay fractions of surface and subsurface horizons in these transects contained about equal amounts of mica, vermiculite, and quartz with less expandables and kaolinite. In the third transect, weathered loessial materials generally contained less mica and more interstratified 10-14 angstrom componens. Clay-free particle-size distribution was the most sensitive parameter of parent material uniformity; total Zr and Ti in silt fractions, and Ti/Zr ratios were less sensitive in that order. (See also W76-06399) (Visocky-ISWS)
W76-06400

LARGE WAVE TANK TESTS OF RIPRAP STABILITY,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 8B.
W76-06410

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1975,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 7C.
W76-06451

EROSION AND SEDIMENT TRANSPORT IN THE OWENS RIVER NEAR BISHOP, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. P. Williams.
Available from National Technical Information Service, Springfield, Va 22161 as PB-251 109/As, $4.50 in paper copy, $2.25 in microfiche. Water-Resources Investigations 49-75, December 1975. 49 p, 22 fig, 9 tab, 26 ref.

Descriptors: *Bank erosion, *Sediment transport, *Erosion rates, *Reservoir releases, *Fisheries, *California, Ecosystems, Brown trout, Sediments, Particle size, Streams, Streamflow, Bed load, Channel erosion, Channel morphology, Data collections, Evaluation, Postimpoundment.
Identifiers: *Owens River(Calif), Pleasant Valley Dam(Calif).

The Owens River near Bishop supports one of the outstanding brown trout fisheries in California. The brown trout prefer to spawn in gravel approximately 0.75 in in diameter. Closure of Pleasant Valley Dam in 1954 has almost eliminated the supply of gravel to the 16-mile study reach of the Owens River. Because of armoring of the channel, scour has been limited to approximately 1 foot in the upper 2.3 miles. Information in this report should be useful in determining long-term erosion effects below Pleasant Valley Dam, in assessing the feasibility of a proposed bypass channel versus retention of the main channel in its present state, and in determining man's influence on river morphology. Bank erosion is accelerated by wide ranges in flow release. Average annual bank-erosion rates were 750 tons from 1947 to 1967, 1,970 tons from 1967 to 1968, and 2,020 tons from 1968 to 1971. Hydraulic geometry at six sites indicates a shift in the river system regime since 1954. These changes have progressed downstream from the dam to a point between sites 4 and 5. Farther downstream channel changes will occur until the channel stabilizes. (Woodard-USGS)
W76-06458

SOIL EROSION AND SEDIMENTATION IN TANZANIA AND LESOTHO,
Secretariat for International Ecology, (Sweden).
For primary bibliographic entry see Field 4D.
W76-06593

INFLUENCE OF VESICULAR HORIZONS ON WATERSHED MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 4D.
W76-06596

ANALYSIS AND INTERPRETATION OF LITTORAL ENVIRONMENT OBSERVATION (LEO) AND PROFILE DATA ALONG THE WESTERN PANHANDLE COAST OF FLORIDA,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 2L.
W76-06637

SOIL STABILIZATION FOR EROSION CONTROL,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W76-06639

CONTROLLING RESERVOIR TRAP EFFICIENCY,
Agricultural Research Service, Columbia, Mo. North Central Watershed Center.
For primary bibliographic entry see Field 8B.
W76-06682

THE BED-LOAD FUNCTION,
Research Council of Alberta, Edmonton. Highway and River Engineering Div.
S. Beltaos.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol. 102, No. HY1, p 131-136, January 1976. 2 fig, 8 ref.

Descriptors: *Bed load, *Sediment transport, Sedimentation, Rivers, *River beds, *Sediment load, Sedimentation rates, Hydraulics, Turbulent flow, Stochastic processes.
Identifiers: *Bed-load function, *Detached particles, Einstein bed-load function, Mean jump length.

A simple derivation of the bed-load function was presented. It was shown that the jump length of detached particles need not be assumed constant, and by treating it as a random variable, that it is only its mean value that influences the rate of transport regardless of what its probability density function may be. The present approach is considerably simpler than Einstein's in that it does not need to consider multiple jumps and their probabilities. Further, a simple empirical equation for the probability of detachment was developed, which could be helpful when dealing with applications of the bed-load function. (Lee-ISWS)
W76-06683

THE TECHNIQUE OF REMOVING LARGE UNDISTURBED SAMPLES OF LAKE SEDIMENT: AN IMPROVED BORE PLUMB, (IN GERMAN),
H. Ambuehl, and H. Buehrer.
Shweiz z Hydrol 37(1), p 175-186, 1975.

Descriptors: *Lake sediments, *Sampling, Analytical techniques, Lakes.

A new sampling device for the extraction of completely undisturbed samples from the lake sediments is described. The core has a diameter of 110 mm and a length of 60 cm or more. Technical prerequisites include a sampling tube without interfering structure and with a very sharp end. The valve (to retain the sample) is designed so that water can flow out of the tube when the device is thrust into the sediment but is absolutely tight after sampling. If the sediment is compact (clay-like) sampling can be carried out without closing the tube at the base. There is an automatic closing mechanism for material with a high water content and an apparatus for subsequent preparation of the sample.
W76-06776

2K. Chemical Processes

THERMODYNAMIC PROPERTIES OF BULK AND OCCLUDED SUPER-COOLED WATER AND IONIC SOLUTIONS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 1A.
W76-06155

REGIONAL DISTRIBUTION OF THE MAJOR DISSOLVED SOLIDS IN THE STREAMS OF ILLINOIS,
Northern Illinois Univ., De Kalb. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-06163

HOT SPRINGS OF RHODESIA: THEIR NOBLE GASES, ISOTOPIC AND CHEMICAL COMPOSITION,
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
E. Mazor, and B. Th. Verhagen.
Journal of Hydrology, Vol. 28, No. 1, p 29-43, January 1976. 6 fig, 3 tab, 11 ref.

Descriptors: *Hot springs, *Gases, *Thermal springs, *Chemical analysis, *Isotope studies, Analytical techniques, Mass spectrometry, Springs, Water types, Spring waters, Argon, Helium, Confined water, Hydrogen, Oxygen, Radioisotopes, Radio-chemical analysis, Chemistry, Instrumentation, Meteoric water, Hydrologic cycle, Ions.
Identifiers: *Noble gases, Isotopic composition, Chemical composition, *Rhodesia, Meteoric origin, Dissolved ions, Noble gas contents.

Four of Rhodesia's hottest spring complexes (54-100 C) were studied. Tritium contents were very low compared to adjacent rivers, indicating that the samples studied were indigenous, deep-seated water which had undergone negligible intermixing with surface water. The noble-gas measurements revealed: (1) the waters are meteoric; (2) the noble gases were kept in closed-system conditions in the ground; (3) paleotemperatures are 26-31 C; and (4) the boiling Binga springs lost part of their noble gases. Independently, measurements of stable isotopes indicated the meteoric origin of the springs. The chemical composition of the waters clearly reflected their origin from two groups of rocks - one from Karroo sediments and one from crystalline rocks. (Henley-ISWS)
W76-06190

SUBARCTIC PLANT COMMUNITIES AND ASSOCIATED LITTER AND SOIL PROFILES IN THE CARIBOU CREEK RESEARCH WATERSHED, INTERIOR ALASKA,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
For primary bibliographic entry see Field 4D.
W76-06194

PUBLIC GROUNDWATER SUPPLIES IN PUTNAM COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-06237

PUBLIC GROUNDWATER SUPPLIES IN MACOUPIN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-06257

CHEMICAL ANALYSIS AND ENVIRONMENTAL QUALITY,
For primary bibliographic entry see Field 5A.
W76-06308

MEASUREMENT IN WATER RESEARCH: PART 1.
For primary bibliographic entry see Field 5A.
W76-06310

WATER QUALITY DATA ALBERTA 1961 - 1973.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 7C.
W76-06374

SODIUM, POTASSIUM, CALCIUM AND MAGNESIUM CONTENT OF NORTHWEST ARKANSAS RAIN WATER IN 1973,
Arkansas Univ., Fayetteville. Dept. of Geology.
For primary bibliographic entry see Field 2B.
W76-06379

SOLUTION CHEMISTRY, MASS TRANSFER, AND THE APPROACH TO CHEMICAL EQUILIBRIUM IN POROUS CARBONATE ROCKS AND SEDIMENTS,
Illinois Univ., Urbana. Dept. of Geology.
V. V. Palciauskas, and P. A. Domenico.
Geological Society of America Bulletin, Vol. 87, No. 2, p 207-214, February 1976. 7 fig, 20 ref.

Descriptors: *Carbonate rocks, *Water chemistry, *Mass transfer, *Equilibrium, *Florida, Sedimentary rocks, Aqueous solutions, Dispersion, Convection, Chemical reactions, Saturation, Velocity, Groundwater movement, Geochemistry, Hydrogeology, Equations, Interfaces, Porous media, Kinetics, Temperature, Pressure, Calcite, Ion transport, Mathematical models.
Identifiers: *Floridan aquifer, Concentration gradients.

The physical and chemical processes that tend to promote an approach to equilibrium between an aqueous solution and one or more minerals in a carbonate system include dispersion, convection, and chemical reactions. When the spatial dependence of ionic constituents was examined from the point of view of these processes, the results showed that the distance to attainment of saturation with respect to an individual mineral increases with increasing rates of dispersion and velocity of groundwater and decreases with increasing rates of reaction. When all the concentration gradients approach zero, the resulting concentration was demonstrated to be a weighted average of the saturation concentrations for the individual minerals. The qualitative aspects of the predicted concentration behavior were in agreement with both field and experimental observations. (Visocky - ISWS)
W76-06384

CHROMATOGRAPHIC DETERMINATION OF DMA AND DMF IN AQUEOUS MEDIUM,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Petroleum Technology and Petrochemistry.
For primary bibliographic entry see Field 5A.
W76-06390

SEMI-AUTOMATED AMMONIA PROBE DETERMINATION OF KJELDAHL NITROGEN IN FRESHWATERS,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5A.
W76-06391

THE LOWER WILCOX AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-06444

SOUTHEASTERN MICHIGAN WATER-RESOURCES STUDY: GROUND WATER AND GEOLOGY,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 4B.
W76-06457

PROGRESS REPORT ON THE WATER RESOURCES INVESTIGATION OF MARTIN COUNTY, FLORIDA,
Geological Survey, Tallahasee, Fla.
For primary bibliographic entry see Field 4B.
W76-06459

ENVIRONMENTAL APPLICATIONS OF ADVANCED INSTRUMENTAL ANALYSIS: ASSISTANCE PROJECTS, FY 74,
Southeast Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5A.
W76-06647

ACTIVITY COEFFICIENTS OF BICARBONATES AND CARBONATES IN SEAWATER,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W76-06720

THERMODYNAMIC LIMITATIONS ON THE USE OF THE PLATINUM ELECTRODE IN EH MEASUREMENTS,
For primary bibliographic entry see Field 5A.
W76-06738

DETERMINATION OF PARTS PER BILLION SULFIDE IN WATER WITH THE SULFIDE-SELECTIVE ELECTRODE,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5A.
W76-06744

THE DETERMINATION OF CARBOHYDRATES IN NATURAL WATERS: A COMPARISON OF PAPER CHROMATOGRAPHIC: COLORIMETRIC AND ENZYMATIC METHODS, (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Institut.
For primary bibliographic entry see Field 5A.
W76-06773

2L. Estuaries

BIOMASS OF ZOOPLANKTON IN THE NEWPORT RIVER ESTUARY AND THE INFLUENCE OF POSTLARVAL FISHES,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Coastal Fisheries Center.
G. W. Thayer, D. E. Hoss, M. A. Kjelson, A. Hettler, and W. F. Larcroix, Jr.
Chesapeake Sci. 15(1), p 9-16, 1974.

Descriptors: *Zooplankton, North Carolina, Estuaries, *Larvae, Biomass, Fishes, Plankton.
Identifiers: Brevoortia-Tyrannus, Lagodon-Rhomboides, Leiostomus-Xanthurus, *Newport River(North Carolina).

Numerical abundance biomass, and caloric content of zooplankton were estimated from biweekly samples collected during 1970-1972 from the lower estuary of the Newport River, North Carolina. All 3 measurements generally were maximum during early fall and again in late winter or early spring. During Nov., larval fishes, primarily pinfish (Lagodon rhomboides), spot (Leiostomus Xanthurus), and menhaden (Brevoortia tyrannus), began entering the estuary. The larvae reached maximum abundance in the estuary during March and April. Zooplankton abundance declined significantly at this time during 1970 and somewhat later during 1971. We hypothesize that zooplankton abundance may control the survival of fishes during their transition from larvae to juveniles and that the larvae have a significant effect in reducing the standing crop of zooplankton. Analysis of the gut contents of these fishes indicated they feed predominantly on zooplankton. Routine metabolism of the larvae would require that the standing crop of larvae graze an average 10% of the 1970 standing crop of zooplankton daily during Jan.-May.--
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W76-06153

ON A STOCHASTIC MODEL TO ESTIMATE TSUNAMI RISK,
Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Ingenieria.
O. A. Rascon, and A. G. Villarreal.
Journal of Hydraulic Research, Vol. 13, No. 4, p 383-403, 1975. 7 fig, 3 tab, 7 ref.

Descriptors: *Tsunamis, *Coasts, *Stochastic processes, *Statistical methods, *Model studies, *Mexico, *Hawaii, Waves(Water), Earthquakes, Hydrography, Analytical techniques, *Risks, Probability, Estimating.
Identifiers: *Mexican Pacific coast, Bayes theorem.

In order to evaluate possibilities of exceedance of the maximum wave height during tsunamis along the Mexican Pacific coast, a statistical study was carried out on the tsunamis that have reached that coast. It was assumed that tsunamis follow a stochastic process represented by Poisson distribution which underlies earthquakes causing most of tsunamis. The available data was tested for consistency by split sampling. Since available data for the Mexican West Coast were scarce, data from other coasts having similar tectonic and hydrographic characteristics were incorporated by mean of Bayes theorem to obtain posterior probability densities. Estimation of the exceedance frequency for maximum amplitudes in the case of long recurrence periods was improved by a second order approximation method. The principal causes of wave height variations are the slope of the oceanic floor at the site, the existence of bays, reefs and promontories, the orientation of the wave front, and the distance to the place where the tsunami originates. (Singh-ISWS)
W76-06189

THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME IX. OCEANS.
Econ, Inc., Princeton, N. J.
For primary bibliographic entry see Field 7B.
W76-06222

VIBRIO PARAHAEMOLYTICUS IN SEAWATER OFF THE PACIFIC COAST OF PANAMA,
Gorgas Memorial Lab., Balboa Heights, Canal Zone.
M. Kourany, R. J. Kinney, and M. A. Vasquez.
Am J Trop Med Hyg. 23(4 Part 1), p 714-715, 1974.

Descriptors: *Pathogenic bacteria, Bacteria, *Panama Canal, Pacific Ocean, *Canal zone, Sea water.
Identifiers: Vibrio-Parahaemolyticus.

The presence of V. parahaemolyticus (pathogen causing diarrheal diseases) in Panama is reported. It was recovered from seawater off the Pacific coastline and in the channel of the Panama Canal. This is the 1st time this organism was isolated in Panama.--Copyright 1975, Biological Abstracts, Inc.
W76-06252

SECONDARY SUCCESSION FOLLOWING EXTENDED INUNDATION OF TEXAS COASTAL RANGELAND,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 4A.
W76-06267

AN INVESTIGATION OF SUSPENDED MATERIAL CONCENTRATIONS IN EASTERN LONG ISLAND SOUND,
Connecticut Univ., Groton. Dept. of Geology; and Connecticut Univ., Groton. Marine Sciences Inst.
W. F. Bohlen.
Journal of Geophysical Research, Vol. 80, No. 36, p 5089-5100, December 20, 1975. 12 fig, 30 ref. OWRT A-041-CONN (4) NOAA NG-20-72.

Descriptors: *Sediments, *Suspended solids, *Estuaries, Bays, Rivers, Erosion, On-site investigations, Sampling, Data processing, Analytical techniques, Sands, Silts, Salinity, Biological properties, Tides, *Connecticut River, Connecticut.
Identifiers: *Long Island Sound(Conn).

A 2-year record of monthly observations of suspended material concentrations at a network of 11 stations in eastern Long Island Sound was used to detail the characteristics of the concentration field and the factors governing its variability. These suspended material distributions display a high degree of spatial and temporal variability, there being only weak correlation between concentrations and concurrent salinity. This behavior contrasts sharply with observations in other regions of the sound. To determine the relative importance of hydrodynamic, meteorological, and biological factors, an ensemble average of selected station data is introduced. This average displays a seasonal variability that can be represented by the combined effects of streamflow and wind stress. Streamflow serves to produce a persistent background concentration. The occurrence of higher frequency fluctuations due to aperiodic discharge events appears limited by the volume and mixing characteristics of the eastern sound. Wind events will dominate the concentration field if high stress levels are maintained for more than 48 hours. Duration requirements are most commonly satisfied during the winter months. Materials introduced by streamflows and wind stress are distributed by the high energy tidal stream. Biological factors exert minor influence on the variability of the concentration field. A review of this system suggested that the eastern sound is more properly viewed as a coastal embayment than as an estuary. Mixing in this area establishes the eastern boundary conditions for the remainder of the sound. (Sims - ISWS)
W76-06381

EROSION ON THE LINE ISLANDS ARCHIPELAGIC APRON: EFFECT OF SMALL-SCALE TOPOGRAPHIC RELIEF,
Scripps Institution of Oceanography, San Diego. Marine Physical Lab.
W. R. Normark, and F. N. Spiess.
Geological Society of America Bulletin, Vol. 87, No. 2, p 286-296, February 1976. 11 fig, 2 tab, 42 ref. NSF GA-31377X.

Descriptors: *Marine geology, *Ocean circulation, *Sedimentation, *Erosion, *Bottom sediments, *Pacific Ocean, Glaciology, Instrumentation, On-site data collections, Tertiary period, Bathymetry.
Identifiers: Deep-towed instrumentation, Sea moats, Line Islands, Submarine peaks.

A moat on the southern edge and another in the northern portion of a small area on the northeast flank of the Line Islands archipelagic apron were studied, using a deep-towed geophysical instrumentation system. These studies showed that flow of bottom currents around relatively small bathymetric features (less than 200 m high) on the Line Islands apron has resulted in substantially more erosion than has occurred adjacent to a nearby ridge 1500 m high. Erosion has produced coalescing moats on the upcurrent sides of two basement outcrops that are the vestiges of a seamount nearly buried by sedimentary deposits of the apron. Pacific Bottom Water, moving eastward through nearby Kingman Passage, is thought to have eroded the moats during glacial periods. Episodic increases of eastward flow of Bottom Water may be occurring at present with velocities sufficient to form ripples within the sandy sediments of the moat floor. Within the same area, a large submarine ridge is flanked by a shallow moat that is merely the result of lower rates of deposition than on the surrounding sedimentary apron. (Singh-ISWS)
W76-06386

A COMPARISON OF THE RESPONSES OF IDENTICAL CUP ANEMOMETERS MOUNTED ON A SPAR AND A TOROID BUOY,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 7B.
W76-06392

THE SALINITY EFFECT IN A MIXED LAYER OCEAN MODEL,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
J. R. Miller.
Journal of Physical Oceanography, Vol. 6, No. 1, p 29-35, January 1976. 4 fig, 2 tab, 9 ref.

Descriptors: *Salinity, *Ocean circulation, *Stratification, *Heat transfer, *Mixing, *Atlantic Ocean, Model studies, Temperature, Oceans, Saline water, Sea water, Thermal stratification, Movement, Diffusion, Circulation, Convection, Tropic, Subtropic, Path of pollutants.
Identifiers: *Mixed layer, Deepening rates.

A model of the thermally mixed layer in the upper ocean as developed by Kraus and Turner and extended by Denman was further extended to investigate the effects of salinity. In the tropical and subtropical Atlantic Ocean rapid increases in salinity occur at the bottom of a uniformly mixed surface layer. The most significant effects produced by the inclusion of salinity are the reduction of the deepening rate and the corresponding change in the heating characteristics of the mixed layer. If the net surface heating is positive, but small, salinity effects must be included to determine whether the mixed layer temperature will increase or decrease. Precipitation over tropical oceans leads to the development of a shallow stable layer accompanied by a decrease in the temperature and salinity at the sea surface. (Bender-ISWS)
W76-06393

TEMPERATURE AND SALINITY STRUCTURE IN THE WEDDELL SEA,
Scripps Institution of Oceanography, La Jolla, Calif.
T. D. Foster, and E. C. Carmack.
Journal of Physical Oceanography, Vol. 6, No. 1, p 36-44, January 1976. 5 fig, 29 ref. NSF GV-34905.

Descriptors: *Antarctic, *Water circulation, *Temperature, *Salinity, *Convection, *Antarctic Ocean, Circulation, Ocean circulation, Saline water, Sea water, Upwelling, Mixing, Movement, Diffusion.
Identifiers: *Weddell Sea, Ekman flux, Double-diffusive convection, Cabbeling instability, Scotia Ridge, Cape Norvegia.

The general circulation of water in the Weddell Sea is part of a large cyclonic gyre. A section taken across this gyre from the Scotia Ridge to Cape Norvegia showed that the Warm Deep Water forms an asymmetric lens-like structure with the thickest portion south of the center of the sea. This large-scale feature of the Weddell Sea is evidently due to a divergent Ekman flux driven by the general atmospheric circulation and upwelling in the center of the gyre. Vertical profiles of temperature and salinity in the center of the gyre showed small step-like structures in the upper part of the transition from colder, less salty Winter Water to the warmer, saltier Warm Deep Water below and large step-like structures in the lower part of the transition region. Double-diffusive convection can take place in both regions. Circumstantial evidence indicated that the cabbeling instability is effective in the large-step region. Internal waves and shear instabilities may also be

mechanisms that contribute to the formation of the step-like structures. (Bender-ISWS)
W76-06394

WAVE FORCES ON BOTTOM-MOUNTED LARGE-DIAMETER CYLINDER,
Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W76-06395

TIDE-INDUCED MASS TRANSPORT IN LAGOONS,
Miami Univ., Fla. Div. of Ocean Engineering; and Rosenstiel School of Marine and Atmospheric Science.
J. van de Kreeke, and R. G. Dean.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 101, No. WW4, Proceedings Paper 11731, p 393-403, November 1975. 7 fig, 12 ref, 2 append. NSF GK-32654

Descriptors: *Lagoons, *Mass transfer, *Mixing, *Water circulation, Bays, Inlets(Waterways), Density currents, Convection, Diffusion, Mathematical studies, Analytical technique, Coastal engineering, Estuaries, Tides.
Identifiers: *Mass transport, *Gulf coast, *Atlantic coast, Flushing.

Tide-induced mass transport is examined in coastal lagoons which are connected to the ocean by more than one opening. An approximate analytic expression for the tide-induced mass transport in a lagoon of uniform width and depth at each end freely connected to a tidal basin was derived, assuming one-dimensional homogeneous flow. Analytic results were compared with numerically computed values of the mass transport. It was shown that the tide-induced mass transport can be an important factor in the renewal of the waters of shallow lagoons. However, since tide-induced mass transport is proportional to the ratio a/h to the second power, where a = amplitude of the tidal wave and h = depth with respect to still water level significant mass transport should be expected only in shallow lagoons. (Bender-ISWS)
W76-06396

STATISTICS OF RANDOM WAVE FIELD,
Worley Engineering Inc., Houston, Tex.
For primary bibliographic entry see Field 8B.
W76-06397

LARGE WAVE TANK TESTS OF RIPRAP STABILITY,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 8B.
W76-06410

CLASSIFICATION OF WETLANDS VEGETATION USING SMALL SCALE COLOR INFRARED IMAGERY,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
F. S. L. Williamson, B. L. Rice, and D. F. Cassel.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-17768, $4.00 in paper copy, $2.25 in microfiche. Annual Report, October 9, 1973 to December 20, 1974, NASA CR-62091, February 1975. 26 p, 8 fig, 16 ref. NASA NAS6-1913.

Descriptors: *Remote sensing, *Wetlands, *Vegetation, *Chesapeake Bay, Aerial photography, Infrared radiation, Photography, *Classification, Marshes, Plant groupings, Data processing, Marsh management.

The purpose of the research reported was to consider classification systems for Chesapeake Bay wetland vegetation. Data processing programs were tested for remotely sensed data on color infrared aerial photos from a small wetlands area and performed detailed vegetation ordinations on field data from another marsh site. Small scale (1:130,000) imagery can, after being digitized and computer processed, distinguish between species associations of Spartina patens/Distichlis spicata, Juncus roemerianus, Spartina alterniflora, and mixtures which are predominantly Scirpus olneyi. Estimates made from the computer-produced map of the areas covered by each association are only approximate and may err by as much as 50%. Two consecutive frames of a marsh scene were classified individually. The class designations for vegetation types were the same for both frames, with the exception of the reversal of one of the water classes with one of the Spartina patens classes. The spectral values (spectral signatures) for classes were not the same for both frames, suggesting that standardization of signatures for native plant associations will be difficult. (Sims-ISWS)
W76-06411

ADVANCES IN HYDROSCIENCE, VOLUME 10-1975.
For primary bibliographic entry see Field 8B.
W76-06412

TIDAL THEORY AND COMPUTATIONS,
Hydraulic Dept. of Deltaworks, The Hague (Netherlands).
J. J. Dronkers.
In: Advances in Hydroscience, Volume 10-1975. Academic Press, New York, New York, p 145-230, 1975. 16 fig, 83 ref.

Descriptors: *Tides, *Tidal waters, *Theoretical analysis, *Oceans, Sea level, Water levels, Water circulation, Tidal streams, Water level fluctuations, Open channel flow, Mathematical studies, Finite element analysis, Analytical techniques, Continuity equation, Equations, Forecasting, Waves(Water), Harbors, Rivers, Junctions, Coasts, Estuaries.
Identifiers: *Tidal equations, Equations of motion.

Development of tidal theory since 1964 was presented in three broad subject areas. (1) Analysis of tides dealt with the basic equations for the prediction of tides. The tidal potential was presented with two methods for tidal prediction: the harmonic method and the response method. A practical application of the harmonic method also was given. (2) Tidal equations discussed the hydrodynamic tidal equations for the dynamic behavior of the tides, for which emphasis was given to the vertical velocity distribution in the derivation of the equations. The convective terms in the dynamic equations were studied separately by introducing terms containing the energy head and the rotor of the velocity vector. The relation between the rotor and the circulation of the water movement was also mentioned. (3) Tidal computations dealt with tidal computations in rivers, seas, and coastal waters. A brief historical review of various methods of computation was given. The harmonic method and the characteristic method were discussed in general terms. The theory of the Kelvin wave for seas with parallel coastal lines was given in more detail because of its theoretical interest for the explanation of the amphidromic points. The main part of this section was devoted to the finite-difference methods to be applied on an electronic computer. More detailed examples of explicit and implicit schemes were given for one- and two-dimensional tidal regions, and practical results were presented. (See also W76-06412) (Humphreys-ISWS)
W76-06414

A STUDY TO ASSESS GOALS FOR USES AND MANAGEMENT OF SHORELINE AND IMPLICATIONS FOR CORPS OF ENGINEERS PROGRAMS.
Coastal Zone Resources Corp. Wilmington, N. C.
For primary bibliographic entry see Field 6B.
W76-06418

NUTRIENT TRANSFORMATIONS IN MASS CULTURES OF MARINE ALGAE,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-06441

DECISIONS FOR DELAWARE: SEA GRANT LOOKS AT LEGAL ASPECTS OF OCS DEVELOPMENT,
Delaware Univ., Newark. Center for the Study of Marine Policy.
For primary bibliographic entry see Field 6E.
W76-06485

JAPAN AND THE UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA,
Johns Hopkins Univ., Washington, D.C., School for International Studies.
For primary bibliographic entry see Field 6E.
W76-06491

INVENTORY OF FLORIDA COASTAL ZONE PLANNING PUBLICATIONS: VOLUME I, COASTAL COUNTIES AND CITIES.
Florida Dept. of Nautral Resources, Tallahassee. Bureau of Coastal Zone Planning.
September 1975, 103 p.

Descriptors: Publications, *Bibliographies, *Florida, *Coasts, Documentation, Coastal engineering, Coastal marshes, Coastal plains, *Cities, *Planning, *Surveys.
Identifiers: *Florida coastal zone, Florida publications, Florida bibliographies, Florida coastal counties, Florida coastal cities.

Volume I inventories those planning documents which have application to one of the 38 coastal counties or to any of the cities lying within the designated coastal zone of the county. (See also W76-06567 and W76-06568)(NDAA)
W76-06566

INVENTORY OF FLORIDA COASTAL ZONE PLANNING PUBLICATIONS: VOLUME II, MULTI-COUNTY PLANNING DISTRICTS.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Coastal Zone Planning.
September 1975, 32 p. 04-4-158-50018, PL 92-583.

Descriptors: Publications, *Bibliographies, *Florida, *Coasts, Documentation, Coastal engineering, Coastal marshes, Coastal plains, *Surveys, Planning.
Identifiers: *Florida coastal zone, Florida publications, Florida bibliographies, *Planning districts.

Volume II includes those planning publications with a regional perspective. Documents in this volume address either the respective planning district as a whole, or areas encompassing more than one county within the district. (See also W76-06566 and W76-06568) (NOAA)
W76-06567

INVENTORY OF FLORIDA COASTAL ZONE PLANNING PUBLICATIONS: VOLUME III, STATEWIDE.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Coastal Zone Planning.
September 1975, 22 p. 04-4-158-50018, PL-92-583.

Descriptors: Publications, *Bibliographies, *Florida, *Coasts, Documentation, Coastal engineering, Coastal marshes, Coastal plains, *Surveys, Planning.

Identifiers: *Florida coastal zone, Florida publications, Florida bibliographies, *Planning districts.

Volume III inventories those relevant documents that focus on either the state of Florida as a whole, or on areas that overlap planning district boundaries. (See also W76-06566 and W76-06567) (NOAA)
W76-06568

THE GREEN BAY WATERSHED PAST/PRESENT/FUTURE,
Wisconsin Univ., Madison Inst. for Environmental Studies.
For primary bibliographic entry see Field 5C.
W76-06569

KANEOCHE ALTERNATIVES: AN APPLICATION OF IMPACT METHODOLOGY.
Hawaii Environmental Simulation Lab., Honolulu.
For primary bibliographic entry see Field 6G.
W76-06574

STATE-OF-THE-ART SURVEY AND EVALUATION OF MARSH PLANT ESTABLISHMENT TECHNIQUES: INDUCED AND NATURAL; VOLUME I: REPORT OF RESEARCH,
Michigan Univ. Ann Arbor, School of Natural Resources.
For primary bibliographic entry see Field 4A.
W76-06635

STATE-OF-THE-ART SURVEY AND EVALUATION OF MARSH PLANT ESTABLISHMENT TECHNIQUES: INDUCED AND NATURAL; VOLUME II: A SELECTED ANNOTATED BIBLIOGRAPHY ON AQUATIC AND MARSH PLANTS AND THEIR MANAGEMENT,
Michigan Univ., Ann Arbor, School of Natural Resources.
For primary bibliographic entry see Field 4A.
W76-06636

ANALYSIS AND INTERPRETATION OF LITTORAL ENVIRONMENT OBSERVATION (LEO) AND PROFILE DATA ALONG THE WESTERN PANHANDLE COAST OF FLORIDA,
Coastal Engineering Research Center, Fort Belvoir, Va.
J. H. Balsillie.
Available form the National Technical Information Service, Springfield, Va. 22161 as AD/A-009 755 $5.50, in paper copy, 2.25 in microfiche. Technical Memorandum No. 49, March 1975. 104 p, 33 fig, 12 tab, 63 ref. 5 append.

Descriptors: *Coasts, *Geomorphology, *Littoral drift, *Florida, Sediments, Sedimentation, Sands, Sediment transport, Beaches, Beach erosion, Winds, Storms, On-site investigations, Aerial photography, Remote sensing, Waves(Water), Ocean waves, Currents(Water).

In 1969, observation and profile stations were established along a 100-mile segment of the western panhandle coast of Florida. Visual measurements of littoral phenomena were taken using systematic techniques of the Littoral Environment Observation (LEO) Program. At six LEO stations, daily observations were made of breaker height, period, and direction of approach, longshore current speed and direction, and windspeed and direction. Foreshore slope was measured daily, and sand samples were collected monthly. Monthly profiles were measured from piers at six localities. Breaker heights were found to increase from east to west. Waves approached the shoreline from eastern quadrants a greater percent of the time than from western quadrants especially along the western part of the study area, showing agreement with net westerly directed longshore current and longshore transport movement, and dominant wind approach directions. Net annual longshore currents ranged from 0.50 to 0.30 ft/s, and were higher in magnitude along the western part of the study area than along the eastern segment. Predicted net annual longshore transport rates ranged from 196,000 to 274,000 cubic yards per year, and again were larger to the west than to the east. Volume change between consecutive monthly profiles indicated net losses of sediment from the littoral zone along most of the study area, with only serious losses at one locality along the western segment. Profile data and aerial photos showed the coast to be characterized by a dual bar system--an inner bar that at times is linear and at other times is broken and sinuous; and an outer, more continuous, persistent bar that acts as a buffer to storm wave attack. (Sims-ISWS)
W76-06637

AN ASSESSMENT OF THE EXPECTED IMPACT OF A DREDGING PROJECT PROPOSED FOR PALA LAGOON, AMERICAN SAMOA,
Hawaii Univ., Honolulu. Sea Grant Program.
For primary bibliographic entry see Field 6G.
W76-06654

USE OF SILVER AND ZINC TO TRACE SEWAGE SLUDGE DISPERSAL IN COASTAL WATERS,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5B.
W76-06655

OBSERVATIONS OF CURRENTS AND TEMPERATURES IN THE SOUTHEAST FLORIDA COASTAL ZONE DURING 1971-72,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
D. A. Mayer, and D. V. Hansen.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. NOAA Tech. rpt. ERL 346-AOML 21, June 1975. 36 p, 11 fig, 5 tab, 3 ref.

Descriptors: Oceans, *Oceanography, *Ocean currents, *Temperature, Tides, Tidal currents, Ocean tides, Velocity measurement, Water flow, Temperature measurement, *Florida, *Coasts.
Identifiers: *Tidal motions, *Current measurement, Coastal water, Coastal zone, Southeast Florida.

Southeast Florida's coastal processes, including currents, temperatures, and wind movements, are described. Fluxes of heat and momentum computed using temperature and velocity measurements as observed in the coastal waters are described. The data recorded indicated that the long, narrow, and shallow shelf region of Southeast Florida is distinctly different from the deeper offshore water where the dominant motions are those of the Florida Current. The shallow water is primarily wind driven, but also subject to tidal motions near tidal inlets. In long current measurement records, the net northward motion is nearly zero. In the winter, the temperature of coastal water is less than the temperature of offshore water by about 1/2 degrees C/km. This positive east-west gradient of temperature is caused by the frequently occurring cold fronts which pass regularly over South Florida in the winter. The momentum flux that had the most spatial variation and, hence, whose divergence was also the largest, was the low frequency covariance between the north and east components of current where its sign actually changed from -26 to 20 cm 2/sec 2 over a distance of only 2 km. (NOAA).
W76-06656

FORTRAN GRAPHICS PROGRAMS FOR PHYSICAL OCEANOGRAPHIC AND TIME SERIES DATA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 7C.
W76-06661

SEWAGE SLUDGE AND AMMONIUM CONCENTRATIONS IN THE NEW YORK BIGHT APEX,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W76-06667

PENETRATION OF THE DEEP LAYER OF THE SAGUENAY FJORD BY SURFACE WATERS OF THE ST. LAWRENCE ESTUARY,
Laval Univ., Quebec. Departement de Biologie.
J. C. Therriault, and G. Lacroix.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 12, p 2373-2377, December 1975. 5 fig, 9 ref.

Descriptors: *Fjords, *Penetration, *Surface waters, *Canada, *St. Lawrence River, *Chemical properties, *Physical properties, Biological properties, Physicochemical properties, Analytical techniques, Chemical analysis, Oceans, Chlorophyll, Plant pigments, Salinity, Water quality, Water temperature, Phosphates, Nitrates, Dissolved oxygen, Destratification, Seasonal, Nutrients.
Identifiers: Saguenay Fjord, St. Lawrence estuary, Surface water penetration, Flood tides, Advected waters.

A strong similarity is demonstrated in summertime physicochemical characteristics between the deep water of the Saguenay fjord and the surface water of the St. Lawrence estuary. Summer warming of the deep layer of the Saguenay is progressive from the mouth towards the head of the fjord. The mechanism proposed was the penetration of surface estuarine water over the shallow sill during the rising tide. The abnormally high chlorophyll values in this deep layer may be explained by the same advective mechanism. (Henley - ISWS)
W76-06674

UPWELLING ALONG THE YARMOUTH SHORE OF NOVA SCOTIA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
C. J. R. Garrett, and R. H. Loucks.
Journal of the Fisheries Research Board, Vol. 33, No. 1, p 116-117, January 1976. 1 fig, 6 ref.

Descriptors: *Upwelling, *Coasts, *Ocean circulation, *Canada, Circulation, Tides, Tidal effects, Tidal energy, Coriolis force, Currents(Water), Estuaries, Oceanography.
Identifiers: *Nova Scotia, Centrifugal force.

Coastal upwelling seems to occur off the southwestern shore of Nova Scotia. It was suggested that this may be driven by centrifugal forces associated with the strong tidal currents past the convex coastline, in much the same way as secondary circulation is generated for river flow round a bend. (Sims-ISWS)
W76-06688

A SIMPLE TOPOGRAPHIC MODEL OF GULF STREAM SEPARATION,
Monash Univ., Clayton (Australia). Dept. of Mathematics.
N. R. Smith, and C. B. Fandry.
Journal of Physical Oceanography, Vol. 6, No. 1, p 22-28, January 1976. 10 fig, 28 ref.

Descriptors: *Model studies, *Ocean circulation, *Atlantic Ocean, *Mathematical models, Circulation, Currents(Water), Winds, Topography, Boundary layers, Oceanography.
Identifiers: *Gulf Stream.

A simple, frictional, linear model was used to study the motion of the Gulf Stream over the con-

tinental shelf. It was found that the combination of frictional and topographic effects may provide a further mechanism by which the observed separation of the Gulf Stream may be achieved. The model predicted separation in the form of a classical separated boundary layer and interrelated the slope of the bottom with the position of separation. Counter-circulations northwest of the stream and increased northward transport of the current were also predicted. (Sims-ISWS)
W76-06689

VERTICAL STRUCTURE OF CURRENTS AND DEEP TEMPERATURES IN THE WESTERN SARGASSO SEA,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
T. E. Pochapsky.
Journal of Physical Oceanography, Vol. 6, No. 1, p 45-56, January 1976. 11 fig, 2 tab, 12 ref. ONR N0014-67-A-0108-0011, NSF GX 30987.

Descriptors: *Ocean circulation, *Ocean currents, *Temperature, *Atlantic Ocean, Currents(Water), Velocity, Sampling, Measurement, On-site investigations, On-site data collections, Buoys, Floats, Oceanography.
Identifiers: *Sargasso Sea, Temperature profiles, Velocity profiles.

Currents and temperatures were measured as a function of depth at two locations during the Mid-Ocean Dynamics Experiments of 1972-73. Instrumented profiling floats were used and flows were determined by acoustic ranging. In some instances floats were trimmed to hover at definite depths in order to increase the resolution and measure local details. The barotropic flows were large, 4.6 cm/s at the 28 deg N, 69 deg 40 min W location and 7.8 cm/s at the 28 deg N, 68 deg 40 min W location. The energy density of the first baroclinic mode was larger than that of the barotropic flow at both locations. The shapes of the horizontal trajectories of the profiling floats changed only slowly from day to day. Superimposed on these profiles were velocity variations of the high vertical wavenumber modes associated with inertia and internal waves. They were within a band of + or -1.5 cm/s below the thermocline and + or -3.5 cm/s in the thermocline. Current profiles as well as hodographs of the velocity on descent showed a chaotic modal structure for those higher frequencies. There was a suggestion of a relationship between the velocity fluctuations profiled and profiles of the temperature or temperature gradient only in a high-resolution section of data near a depth of 2 km. The occurrence of Richardson numbers near unity was fairly common over depth intervals of approximately 100 m. (Sims-ISWS)
W76-06690

STUDY OF THE DISPERSION OF BACTERIOPHAGES IN A NATURAL MARINE ENVIRONMENT, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France); and Institut National de la Recherche Medicale, Paris (France).
For primary bibliographic entry see Field 5B.
W76-06691

THE DYNAMIC STRUCTURE OF THE FRONTAL ZONE IN THE COASTAL UPWELLING REGION OFF OREGON,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
C. N. K. Mooers, C. A. Collins, and R. L. Smith.
Journal of Physical Oceanography, Vol. 6, No. 1, p3-21, January 1976. 16 fig, 5 tab, 64 ref. NSF GP4472, GA[illegible], GA27296.

Descriptors: *Upwelling, *Coasts, *Oregon, *Pacific Ocean, Ocean currents, Currents(Water), On-site data collections, On-site investigations, Temperature, Salinity, Continental shelf, Continental slope, Oceans, Oceanography.
Identifiers: Pycnoclines.

The frontal zone of the coastal upwelling region off Oregon was studied from observations made between July and September in 1965 and 1966. The alongshore flow field was determined by combining direct measurements and geostrophic calculations. A near-surface southward jet and a subsurface northward undercurrent existed in the frontal zone. They were separated by an inclined frontal layer (permanent pycnocline). The frontal layer tended to intersect the sea surface about 10 km offshore, where a surface front was formed. Through a combination of direct current measurement and water mass analysis, the cross-stream flow was estimated to be seaward near the surface, shoreward at the top of the inclined frontal layer, but seaward at the bottom of the inclined frontal layer and shoreward below that. During a 25 h anchor station, a high degree of correlation existed between the vertical structure of the alongshore and cross-stream flows. An anomalously warm water mass occurred at the base of the frontal layer. It is believed that it was formed near the surface front and that it sank and flowed seaward along the base of the inclined frontal layer. Vertical shears in the horizontal velocity were caused by the mean baroclinic flow and the tidal and longer period baroclinic oscillations. (Sims - ISWS)
W76-06695

TELEDETECTION BY AIRPLANE AND SATELLITE IN THE STUDY OF MARINE POLLUTION, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 5A.
W76-06717

DEGREE OF POLLUTION OF THE SAINT LAWRENCE RIVER FROM REPENTIGNY TO MONTMAGNY, (IN FRENCH),
Laval Univ., Quebec. Departement des Vivres.
For primary bibliographic entry see Field 5B.
W76-06734

DEGREE OF POLLUTION OF THE SAINT LAWRENCE RIVER FROM REPENTIGNY TO MONTMAGNY: II. BIOCHEMICAL POLLUTION, (IN FRENCH),
Laval Univ., Quebec. Departement Des Vivres.
For primary bibliographic entry see Field 5B.
W76-06735

THERMODYNAMIC LIMITATIONS ON THE USE OF THE PLATINUM ELECTRODE IN EH MEASUREMENTS,
For primary bibliographic entry see Field 5A.
W76-06738

THE WINTER DISTRIBUTION OF ULTRAVIOLET ABSORPTION IN THE SURFACE WATERS OFF THE WEST COAST OF THE BRITISH ISLES,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W76-06739

SEASONAL DISTRIBUTION OF ULTRAVIOLET ABSORPTION IN THE SURFACE WATERS OF LIVERPOOL BAY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W76-06740

THE IMPORTANCE OF THE EFFECT OF THE CHEMICAL COMPOSITION OF WATER ON THE POPULATION OF SNAILS: INTERMEDIATE HOSTS OF SCHISTOSOMES IN EGYPT,
Bilharziasis Research Inst., Cairo (Egypt).
For primary bibliographic entry see Field 5C.
W76-06763

PHYTOSOCIOLOGICAL STUDIES OF AQUATIC AND MARSH VEGETATION IN MORE OG ROMSDAL, WESTERN NORWAY, (IN NORWEGIAN),
L. Malme.
K Nor Vidensk Selsk Mus Misc 22, p 1-30, 1975.

Descriptors: Lakes, Europe, Vegetation, *Marsh plants, Marshes, Aquatic life, Ecology.
Identifiers: *Hydrochemical studies, *Norway, Phytosociological studies.

Phytosociological descriptions are given of aquatic and marsh communities in 26 lowland lakes. Eleven vegetational types are distinguished on a basis of floristic composition, belonging to the 3 classes: Potametea, Littorelletea and Phragmitetea. Ecological conditions are discussed. The different associations have wide tolerance limits with regard to certain hydrochemical factors.--Copyright 1975, Biological Abstracts, Inc.
W76-06767

SEQUENCES OF EFFECTS OF A CITY SEWER: AS A FUNCTION OF THE REMOVAL OF THE SOURCE OF POLLUTION, ON THE PHOTOPHILE POPULATIONS GROWING IN EXPOSED PLACES (ALGAL FRACTION); FIRST RESULTS, (IN FRENCH),
Aix-Marseille-2 Univ. (France). Laboratoire de Biologie Vegetale.
For primary bibliographic entry see Field 5C.
W76-06770

THE HEAVY METAL CONCENTRATIONS IN THE MARINE SEDIMENTS ALONG THE COAST OF FUKUYAMA, (IN JAPANESE),
Kagoshima Univ. (Japan). Marine Biology Lab.; and Kagoshima Univ. (Japan). Environmental Sciences.
For primary bibliographic entry see Field 5A.
W76-06774

SUSPENDED MATTER AND ITS COMPONENTS IN THE BLACK SEA, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5B.
W76-06778

PETROLEUM-OXIDIZING BACTERIA FROM THE GULF OF FINLAND, (IN RUSSIAN),
Dep. Moscow State Univ. (USSR). Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-06788

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

THE RALPH M. PARSONS COMPANY CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Parsons (Ralph M.) Co., Pasadena, Calif.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 584, $9.00 in paper copy, $2.25 in microfiche. Special Report No. 12, August 1965, 492 p, 24 fig, 9 tab. OSW 14-01-0001-516.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria.
Identifiers: *Process design.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. This design concept is based on the multistage flash process consisting of 94 heat recovery stages and 4 heat rejection stages with a maximum brine temperature of 273F. Plant consists of three parallel lines each supplying one-third the total output, each operating independently of the others to facilitate maintenance and repairs. Vessels are of corrugated metal pipe arch section permitting longitudinal thermal expansion to be absorbed within the vessel walls. Interior surfaces of the vessels exposed to seawater are cupro-nickel clad. 70-30 CuNi is selected for heat exchange surfaces. Cost of product water is $0.525 per thousand gallons. (See also W76-00158 thru W76-00173.) (OWRT)
W76-06151

DESALTING PLANTS INVENTORY, REPORT NO. 4,
Office of Saline Water, Washington, D.C.
F. O'Shaughnessy.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251-575, $4.00 in paper copy, $2.25 in microfiche. March, 1973, 27 p, 1 fig, 4 tab.

Descriptors: *Desalination plants, Surveys, *Distillation, Water supply, *Membrane process, *Freezing, Sites, Dual purpose, Fuels, Electric power plants.

Summary information is provided on location, size, type of process, year construction began or of plant commissioning, and name of process contractor. Also included, when and as provided by the manufacturer, are data on type of water feed, product water use, type of fuel used, and whetner or not a desalting plant operates in conjuction with an electric power generating plant (single or dual purpose). According to manufacturer's information, there were 812 land-based desalting plants of 25,000 gallons-per-day capacity or larger in operation or under construction throughout the world as of January 1, 1972. These plants are capable of producing about 348 million gallons of fresh water daily for cities and industries. Distillation is the most widely used, accounting for 93% of total capacity. The balance is almost entirely in membrane processes, with freezing accounting for less than 1%.
W76-06152

DISPOSAL OF SOLUBLE INORGANIC SALTS,
Tulsa Univ., Okla.
For primary bibliographic entry see Field 5D.
W76-06156

CONVERSION OF DESALINATION PLANT BRINES TO SOLIDS,
Badger (W. L.) Associates, Inc., Ann Arbor, Mich.
F. C. Standiford.
OWRT/S--76/29, October 10, 1970. 118 p, 29 fig, 9 tab, 27 ref. DoI 14-30-2660.

Descriptors: *Dissolved solids, Desalination plants, Brines, *Brine disposal, *Desalination, Distillation, Solar evaporation, Ponding, Cost comparisons, Injection wells, Waste disposal, Solid wastes, Feasibility.
Identifiers: Deepwell injection.

This final report of a study to investigate means of turning desalination plant waste brines into solids for disposal surveys the chemical and process industries to determine those processes which have a potential for removing or reducing solids from solution when treating the brine effluent from disalination plants. It attempts to determine the potential size limitations of various methods and by comparing advantages and disadvantages to determine the economic feasibility of each. A conceptual design is presented for a plant treating the effluent from a 2.5 MGD desalination plant to evaluate the feasibility of such a system and provide plant scaling factors for 1 to 10 MGD plants. Capital and operating cost estimates are provided.
W76-06248

PARAMETRIC DATA FOR LONG TERM OPERATION OF A VERTICAL, PLANE SURFACE, FALLING FILM, VAPOR COMPRESSION EVAPORATOR,
Resources Conservation Co., Renton, Wash.
H. Herrigel, T. O'Neail, and T. Fosberg.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 694, $4.00 in paper copy, $2.25 in microfiche. OWRT/S--76/30, June 1973. 42 p, 15 fig, 4 tab, 1 ref. DoI 14-30-2939.

Descriptors: *Desalination, *Distillation, *Vapor compression distillation, Evaporators, Chemical analysis, *Aluminum alloys.
Identifiers: Falling film, Solids concentration.

A long term test was conducted to demonstrate the ability of a vertical, plane surface, falling film, vapor compression evaporator to concentrate Roswell, N. Mex. brackish well water without scaling. The 14,000 mg/l TDS Roswell well water was concentrated 11 times to 145,000 mg/l TDS and a 17,500 mg/l natural suspended solids level. The system operated for a total of 112 days during this test program with the longest continuous run being 77 days. The tests were successful in demonstrating the long term effectiveness of the process and equipment.
W76-06249

OPERATING DATA OF A VERTICAL PLANE SURFACE, FALLING FILM EVAPORATOR USING SLURRY AND HIGH CONCENTRATION FEEDS,
Resources Conservation Co., Renton, Wash.
H. Herrigel, T. Fosberg, W. Stickney, and C. Perry.
Available from the National Technical Service, Springfield, Va 22161 as, PB-251 695, $5.50 in paper copy, $2.25 in microfiche. OWRT/S--76/27, October 1972. 102 p, 29 fig, 11 tab, append. DoI 14-30-2939.

Descriptors: *Brackish water, *Corrosion control, Operations, *Scaling, *Evaporators, *Desalination, Design.
Identifiers: Boiling point elevation, pH control, Falling film evaporation, Seeding processes.

Demonstration tests with a 5,000 gpd Laboratory Research Unit (LRU) substantiated the ability of a vertical, plane surface, falling film evaporator to take Roswell, N. Mex brackish, well water to high concentrations without scaling. Two series of test conditions were run, each for a period of approximately 20 days. Tests were run at about 11 concentrations and at 25 concentrations over a range of condensing temperatures. Heat transfer coefficients above 1,000 Btu/hr-ft2-F degrees were consistently achieved throughout the tests. Process conditions were identified and verified for scale-free operation. A conceptual design and economic study of a 2.5 mgd plant (based on feed rate) showed that 90 percent of the Roswell brine could be converted to fresh water at a recovery rate of 24.7 pounds of water per 1,000 Btu. Ninety-six percent conversion may be achieved at an overall rate of 22.3 pounds per 1,000 Btu with increased capital costs. Cost of product water from the 2.5 mgd plant is $2.08/1,000 gallons for 96 percent conversion.
W76-06250

COMPUTATIONAL METHODS APPLICABLE TO THE COUPLED VTE/MSF DISTILLATION SYSTEM,
Electronic Associates, Inc., West Long Branch, N. J.
B. T. Fairchild, and C. S. Rhee.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 640, $5.00 in paper copy, $2.25 in microfiche. OWRT/S--76/25, September 1973. 80 p, 4 fig, 10 tab. DoI-14-30-2845.

Descriptors: *Desalination, *Distillation, *Evaporators, Flash distillation, *Computer models, *Simulation analysis.
Identifiers: *VTE/MSF distillation system, Process variables, Flash stage, Vertical tube effect.

The Orange County Plant was selected initially as an example of a VTE/MSF system for the current study. However, before completion, it was directed that the Freeport Test Bed Plant be implemented. Since the computer programs were structured in a modular fashion, the contract effort was easily diverted. The vertical tube effect/multistage flash portion of the Freeport Test Bed Plant is simulated to provide steady-state profiles of all important process variables for a variety of process specifications. Mathematical models are developed for a flash stage, a vertical tube effect, a vapor flow stream, and a brine heater. Those components are combined for the Freeport Plant, and appropriate convergence schemes are applied to obtain consistent solutions. Computer programs are structured in a modular fashion such that similar systems may be conveniently implemented. For the current study, emphasis is not placed on generation of extensive steady state results, but rather on demonstration of a capability for producing consistent steady state results for a variety of process specifications.
W76-06253

VERTICAL TUBE DISTILLATION DESALTING, STATE-OF-THE-ART (1971), NOMOGRAPH BOOKLET.
Hittman Associates, Inc., Columbia, Md.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 687, $5.00 in paper copy, $2.25 in microfiche. OWRT/S--76/24, January 1972. 58 p, 17 tab, 22 ref. DoI-14-01-001-1748.

Descriptors: *Desalination, *Distillation, *Evaporators, *Capital costs, Data collections.
Identifiers: *Vertical Tube Evaporators, *Process parameters, Product water cost, *Nomographs.

A series of nomographs were prepared which evaluate the cost and process parameters of vertical tube evaporator plants. The data used to compile these nomographs was taken from a series of Office of Saline Water R and D Reports, published articles, manufacturers information and actual plant data related to the process and its economics. The Economic data has been updated to a late 1971 base by use of engineering cost indices. Process parameter relationships utilized were updated in accordance with latest desalination data. The purpose of these nomographs is to allow estimates to be made concerning various cost and design parameters related to the vertical tube evaporator (VTE) process. Utilization of the nomographs will allow estimates of the cost of water, plant capital costs, cost of energy, and plant tubing area to be made.

W76-06254

VERTICAL TUBE DISTILLATION DESALTING, STATE-OF-THE-ART (1971).
Hittman Associates, Inc., Columbia.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-224 277, $6.75 in paper copy, $2.25 in microfiche.OWRT/S--76/23, November 1972. 142 p, 25 fig, 17 tab, 79 ref. DOI 14-01-001-1748.

Descriptors: *Evaporators, Flash distillation, *Desalination plants, *Distillation, Reviews, Performance.
Identifiers: Concentration ratios, *Vertical tube evaporators.

The state-of-the-art design, performance, and economics of downflow thin film vertical tube evaporator (VTE) desalting plants were analyzed and reviewed. Both single- and dual-purpose plants ranging in size from 1 to 250 MGD capacity were evaluated. The VTE has been in use for some time, but its application in large scale desalting projects is only 10 years old. The largest U.S. commercial plant is 1 ,GD (11 effects at a performance ratio of 9.3) and the largest experimental test bed is also 1 MGD (17 effects, performance ratio of 13.2). Designs ranging up to 250 MGD have been prepared. Recent innovations include integration of multistage flash (MSF) preheaters with the VTE equipment yielding apparent economies in materials, fabrication, and operation. Current technology emphasizes the use of enhanced surfaces for improvement of evaporation/condensation heat transfer. Concrete lined steel appears to offer long term corrosion resistance to hot seawater brines. Current plants and designs yield from 0.75 to 0.85 pounds of product water per 1000 Btu (initial heating steam) per effect at concentration ratios of 2.5 to 3.0. Two and three inch diameter evaporator tubes of Al-brass or 90-10 CuNi currently are the most attractive materials.
W76-06255

THE CONTROL AND OPERATION OF NUCLEAR DESALINATION SYSTEMS,
New South Wales Univ., Kensington (Australia). School of Nuclear Engineering.
L. G. Kemeny.
Journal of Hydrology (Amsterdam), Vol. 28, No. 2/4, p 449-468, February 1976. 7 fig, 3 tab, 12 equ, 7 ref, 2 append.

Descriptors: *Water resources, *Desalination plants, Operations research, Control, Optimization, Economics, Nuclear energy, Monitoring, Equations, Economics, Water treatment.
Identifiers: *Nuclear desalination systems.

The operation, control, and optimization of desalination plants in which the prime source of energy is derived from nuclear fuel and in which the sea or bore water is evaporated in multi-stage flash evaporator units presents no new scientific or technological. The unresolved difficulties associated with this technique are to be found more in the general fields of chemical control, corrosion prevention, and long term reliability. Herein, the 'desalination system' is assumed to consist of: (1) nuclear steam raising; (2) numerous multi-stage flash evaporator units; and (3) chemical water treatment plant. For non-technical reasons, only typical cases of plants in the ten to one hundred million gallon per day output size are considered, and specific references to nuclear system designs and operating flash evaporator installations are avoided. The paper is a condensed version of a manuscript which will be submitted for publication elsewhere. Discussed are system operation, characteristics of a typical plant, flash evaporator diagnosis, system control, nuclear plant dynamics (including nuclear time constants and boiler primary heat balance), and system optimization. In conclusion, a medium sized plant of the type described may be economically justified if built in Australia only after the most detailed cost optimization. (Bell-Cornell)
W76-06426

HYDROLOGIC EVALUATION OF SALINITY CONTROL AND RECLAMATION PROJECTS IN THE INDUS PLAIN, PAKISTAN--A SUMMARY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5G.
W76-06453

AUTOMATIC WATER DISTILLER,
For primary bibliographic entry see Field 5F.
W76-06469

EVAPORATION APPARATUS OF SPECIAL MATERIAL,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y. (Assignee).
For primary bibliographic entry see Field 5D.
W76-06482

PRELIMINARY ENGINEERING ANALYSIS, YUMA DESALTING PLANT.
Burns and Roe, Inc., Paramus, N. J.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 873, $7.50 in paper copy, $2.25 in microfiche. OWRT/S--76/33, November 1974. 175 p, 14 fig, 19 tab, 2 append. 14-30-3270

Descriptors: *Desalination, *Desalination processes, *Membrane processes, Reverse osmosis electrodialysis, *Water treatment, Brackish water, *Irrigation, *Return flows, Cost analysis, Salinity control, Arizona, Colorado River.
Identifiers: Yuma Desalting Plant, Yuma Arizona, Lime softening process, Plant control membrane replacement criteria.

An evaluation was made of alternate membrane desalting and pretreatment processes, including cost estimates, for the 100 mgd Yuma Desalting Plant. Recommendations were also derived on procurement procedures, guarantee provisions, plant control and membrane replacement criteria. Both electrodialysis and reverse osmosis were considered for this application because of the salinity range projected for the Wellton-Mohawk drain water which would serve as the feed to the desalting plant. The lime softening process with solids contact reactors and dual media gravity filters was selected as the best pretreatment system. An additional advantage of the lime softening process is that reduction of the calcium and total dissolved solids increases the safety maragin for scale formation permitting temporary higher recoveries, if necessary, to maintain salt balance. The analysis concluded that the final plant configuration for the constructed desalting plant would be determined by competitive bidding and that more than one manufacturer will probably be supplying equipment for the final plant. Accordingly, a base case design and cost estimate was developed for a plant equally split, on the basis of salt removed between hollow fiber reverse osmosis, spiral wound reverse osmosis and electrodialysis.
W76-06547

10,000,000 GALLON PER DAY SECONDARY REFRIGERANT FREEZE DESALTING PLANT.
Dravo Corp., Pittsburg, Pa. Blaw-Knox Chemical Plants Div.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-251 906, $7.50 in paper copy, $2.25 in microfiche. OWRT/S--76/32, June 29, 1973. 121 p, 32 fig, 52 tab. DUI 14-30-3160

Descriptors: *Desalination processes, *Freezing, Sea water, Heat transfer, *Desalination plants, Potable water, Water treatment.
Identifiers: Butane, Direct contact, Continuous process.

This report describes a continuous process for producing potable water from sea water by partial freezing. Ice slurry is produced in a freezer by direct contact of sea water with liquid butane at the pressure slightly below atmospheric at which butane boils at the temperature of freezing saline water, deriving its heat for vaporization from ice formation. The resulting slurry of ice in brine is sent to a washer, where the ice is washed substantially free of salt, using part of the melted ice as the wash liquid. Washed ice is then melted by direct contact with slightly compressed butane vapor from the freezer. Butane condenses as it melts the ice, and condensate is recycled to the freezer. Cold from the potable water and product brine stream is recovered in the incoming feed by a heat interchange system employing vaporization and condensation of butane in direct contact with the aqueous streams. Since the system operates below ambient temperature and since heats of compression and pumping and heat in the feed sea water must be removed, heat is pumped from the system by compressing butane vapor not condensed in the melter to a pressure at which it can be condensed by the existing product streams.
W76-06549

A STANDARDIZED PROCEDURE FOR ESTIMATING COSTS OF SALINE WATER CONVERSION.
Office of Water Research and Technology, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 888, $4.50 in paper copy, $2.25 in microfiche. OWRT/S--76/31, March 1956. 45 p, 17 fig, 4 tab, 20 ref.

Descriptors: *Desalination, *Desalination processes, *Comparative costs, *Engineers estimates, *Estimated costs.
Identifiers: *Cost estimating procedures, Standardized costing procedures.

This report presents a standardized procedure for making initial cost estimates for demineralization of saline waters by various processes. Any given estimate will not necessarily represent the cost of a process at a specific location but will represent the order of magnitude for the water cost under the assumed conditions and permit valid comparison of various processes. Cost estimates are first approximations based on selected costs for investment, fuel and power, with approximations for labor, supervision, maintenance, and other items. The standardized cost estimating procedure is presented in three parts, (1) a summary of the items in tabular form for estimating the costs, (2) discussion of the many factors contributing to the cost estimating procedure, and (3) an appendix which includes cost estimates for various items of equipment, and analyses of saline waters.
W76-06550

SOLAR ENERGY TECHNOLOGY, STATE OF THE ART, AN ANNOTATED BIBLIOGRAPHY,
Ocean Engineering Information Service, La Jolla, Calif., Energy Resources Div.
E. Sinha, and B. McCosh.
Ocean Engineering Information Series Vol. 1 (1975), 83 p.

Descriptors: *Bibliographies, Reviews, Solar distillation, Solar radiation, *Distillation, *Desalination, Energy, *Energy conversion, Heat transfer, Desalination plants, Desalination apparatus.
Identifiers: *Solar energy.

This bibliography contains 547 informative abstracts of the worldwide literature providing substantial scientific and technological information on the state-of-the-art of solar energy utilization. Subjects covered include: patents; equipment and

materials (photovoltaic cells, collectors, concentrators, materials); buildings (heating, cooling - air conditioning); electric power generation (photovoltaic conversion with electric storage, solar-thermal conversion with heat storage); total energy systems; space solar power stations (geosynchronous satillite solar power plant, microwave transmission to earth); solar sea power plants; bioconversion; special applications (agricultural, desalination, distillation, Industrial, navigation aids and naval facilities); energy conversion; energy storage; heat transfer; availability, climate, solar radiation measurement; economic analysis - costs; bibliographies; and geographic sites of special studies. The usefulness of the bibliography is enhanced by the inclusion of a subject outline which is supplemented with a keyterm index and an author index. References were selected from literature published during the past five years but a few older ones of special current interest are included. The bibliography is intended to serve as an interdisciplinary guide to the state of the art.
W76-06565

PRELIMINARY DESIGN OF A DIESEL-POWERED VAPOR-COMPRESSION PLANT FOR EVAPORATION OF SEAWATER,
Oak Ridge National Lab., Tenn.
S. J. Senatore.
ORNL-4049, Special, (OSW RDPR276), December 1966. 123 p, 13 ref. DoI 14-01-0001-534.

Descriptors: *Desalination plants, Sea water, *Evaporators, Evaporation, *Vapor compression distillation, Capital costs, Operating costs.
Identifiers: *Vertical-tube evaporators.

The purpose was to determine whether the combination of a diesel engine or a gas turbine with a vapor compressor and a vertical-tube evaporator has good economic potential for desalting of seawater in plants of the 1- to 3-million-gallons-per-day (Mgd) range. The study concentrates on commercially available components which could be applied to a prototype or test bed plant with only a modest development effort. The study shows that the engine-driven vapor compressor-VTE concept has good potential for reducing the cost of distilled seawater in water-only plants of the size range 1 to 10 Mgd. The primary advantage of the system lies in its possibility of achieving heat economies of 20 to 27 lb product per 1000 Btu fuel consumption (for both heat and pumping energy), without the necessity of utilizing high brine temperatures or very low temperature differences. Alternative fuels are natural gas, diesel oil, or residual oil.
W76-06750

3B. Water Yield Improvement

WATER RELATIONS OF SELECTED SPECIES OF CHAPARRAL AND COASTAL SAGE COMMUNITIES,
San Diego State Univ., Calif. Dept. of Biology.
D. K. Poole, and P. C. Miller.
Ecology, Vol. 56, No. 5, p 1118-1128, Late Summer, 1975. 11 fig, 1 tab, 30 ref.

Descriptors: *Plant physiology, *Soil-water-plant relationships, *Moisture stress, *Turgidity, *Chaparral, *Sagebrush, Drought tolerance, Stomata, Moisture uptake, Moisture availability, Water balance, *California, Coasts, Semiarid climates, Shrubs, Soil moisture.
Identifiers: Artemisia californica, Schlerophylls, Arctostaphylos glauca, Ceanothus greggii, Rhus ovata, Rhus laurina, Rhus integrifolia, Adenostoma fasciculatum, Heteromeles arbutifolia.

Water potentials, leaf resistances to water loss, and relative saturation deficits of selected shrub species were measured from June 1973 through May 1974 at coastal and inland sites in southern California. Both the chaparral and coastal sage communities occur in a semiarid Mediterranean-type climate characterized by hot, dry summers and cool, wet winters. By December, the drought-deciduous Artemisia californica had water potentials less than -65 bars. The evergreen species sclerophylls was divided into 3 categories: (1) Arctostaphylos glauca and Ceanothus greggii developed lowest water potentials (less than -65 bars) and showed stomata least responsive to water potential, 2) Rhus ovata, Rhus laurina, and Rhus integrifolia had highest water potentials (about -25 bars) and stomata most responsive to water potential, and (3) Adenostoma fasciculatum and Heteromeles arbutifolia exhibited intermediate water potentials and stomatal responses. Water stress occurred earlier in the summer at the coastal site because of less rainfall. Where competition was most severe (on north facing slopes), soil moisture was reduced earlier in the summer and as a result, soil moisture content and plant water potentials were higher on the south-facing slope at the inland site. (Robinett-Arizona)
W76-06259

MORE WATER FOR ARIZONA.
Arizona Water Resources Committee, Phoenix; and Arizona Water Commission, Phoenix.
September 1974. 28 p, 18 fig, 1 tab.

Descriptors: *Water yield improvement, *Arizona, *Water resources, *Water harvesting, *Watershed management, *Surface runoff, Water conservation, Water yield, Runoff, Snowpacks, Vegetation effects, Forest management, Water supply, Groundwater resources, Recreation, Lumber.

Arizona's current annual water demand is about 7 million acre-feet, of which about 2 million comes from surface water sources and the remaining 5 million from pumped groundwater. Of this 5 million from groundwater, about 2 or 3 million acre-feet is overdrought. Arizona's water supply for municipal, industrial, agricultural and recreational uses can be increased significantly by management of vegetation on watersheds. Often, the same management practices which produce such increases will also result in improved production of timber, forage and water for livestock and game, and recreational values. An improvement of the aesthetic aspects of the land plus alleviation of such problems as fire control and soil erosion are also realized in many cases. As much as 1,200,000 acre-feet of water a year on the average could be harvested to supplement Arizona's present supply of surface water. Before initial judgments can be made as to whether or not a given watershed can be made more productive, a comprehensive inventory of data on precipitation, slope angle, soil type and depth, vegetation densities, and existing priorities of land use and values is necessary. In addition, there still remains the scientific need for the development of reliable means to extrapolate information gained from small experimental plots to large, operational areas. (Robinett-Arizona)
W76-06261

WATER-SAVING DEVICES: THE STATE OF THE ART,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 3D.
W76-06317

METHOD FOR COLLECTING SCALE FORMATIONS IN WATER PIPES,
Key II Industries, Camarillo, Calif. (Assignee).
For primary bibliographic entry see Field 8G.
W76-06479

LARGE SCALE EFFECTS OF CLOUD SEEDING,
Aerometric Research, Inc., Goleta, Calif.
K. J. Brown, R. D. Elliott, and J. R. Thompson.
Report ARI 75-2, June 1975. 230 p, 30 fig, 4 tab, 28 ref, 8 append. 14-06-D-6841.

Descriptors: *Weather modification, Precipitation(Atmospheria), *Cloud seeding, Cloud physics, Rainfall.

At the conclusion of a nine year study to determine the Large Scale Effects of Cloud Seeding, the statistical evidence indicates that modification of precipitation patterns over a large area is a persistent feature in all of the winter orographic seeding programs studied. The most frequent location for these extra-area effects is 150-200 km from the seeding source and 20 to 40 deg to the right of the 700 mb wind flow. The extra-area effect is always of the same sign and generally slightly larger in magnitude than the primary seeding effect. It is hypothesized that the major extra-area enhancement of precipitation occurs during those portions of orographic storms containing organized convection. The increase in precipitation would be due to an enhancement of convective activity by conversion of water to ice with attendant changes in meso-scale circulation patterns which result in prolonging the convective activity. A secondary zone of enhanced precipitation frequently appears about 150-200 km downwind from the seeding source. This area appears to be merely an extension of the primary seeding effect due to the long trajector of small ice crystals produced by seeding. The quantity of precipitation produced in this area is small and only detectable when it occurs in a normally arid region. (Bureau of Reclamation)
W76-06562

COLORADO RIVER BASIN PILOT PROJECT, FINAL COMPREHENSIVE OPERATIONS REPORT,1970-1975 SEASON,
EG and G, Inc., Durango, Colo. Environmental Services Office.
L. M. Hjermstad.
Report AL-1200, Dec. 23, 1975. 161 p, 41 fig, 31 tab. 14-06-D-6963

Descriptors: *Artificial precipitation, Atmosphere, *Colorado, *Cloud seeding, Clouds, Forecasting, Meteorology, Nucleation, Orography, River basins, Silver iodide, Snow, Snowpack, Storm structure, *Weather modification, Colorado River Basin, Precipitation(Atmospheric).
Identifiers: San Juan Mountains(Colo).

Operational aspects are summarized of five winter seasons of weather modification research under the Colorado River Basin Pilot Project. The program was a randomized research seeding program under the direction of the Bureau of Reclamation. All aspects of the program design, field equipment, operational criteria plan, opportunity recognition forecasting, and seeding operations for the five operational seasons are reviewed. Evaluation of experimental data collected during the operational periods of the program indicate that the orographic cloud systems over the San Juan Mountains respond to seeding with silver iodide similar to orographic cloud systems seeded in the vicinity of Climax, Colorado. (Bureau of Reclamation)
W76-06564

WATER HARVESTING: STATE OF THE ART,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
K. R. Cooley, A. R. Dedrick, and G. W. Frasier.
Watershed Management, Proceedings, August 11-13, 1975, Logan, Utah. Irrigation and Drainage Div. American Society Civil Engineers, N. D., p. 1-20, 81 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Vegetation effects, *Land forming, *Soil treatment, Rainfall-runoff relationships, Rain water, Runoff, Soil types, Soil sealants, Precipitation(Atmospheric).
Identifiers: Water storage, *Reviews.

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Water harvesting depends on natural precipitation and is therefore limited to areas where precipitation is sufficient and variability is not excessive. The particular water harvesting method used to collect precipitation depends on several factors including soil type and depth, vegetative cover, surface roughness and slope, climatic factors, land, labor, and material costs, water use rate and distribution, water quality desired, and availability of materials. Commonly used methods are vegetation management, land alteration, chemical or physical soil treatments, and soil covers. Annual precipitation in excess of 280 mm is generally required for successful vegetation management results with runoff yield increasing as annual precipitation increases. Land alteration is especially attractive where impervious areas already exist and only collection and storage facilities are required. Land alteration is economically feasible in areas where labor costs are low and soil conditions are suitable. Successful chemical and physical soil treatments have been applied to certain soils, but more research is needed to delineate the conditions under which each can be used. Soil covers are generally not restricted by soil and climatic conditions but usually have a higher initial cost than other methods. Water collected from catchments can be stored in the soil, excavated ponds, bags, or tanks. (Robinett-Arizona)
W76-06584

SALTCEDAR (TAMARIX CHINENSIS) SEED PRODUCTION, SEEDLING ESTABLISHMENT, AND RESPONSE TO INUNDATION,
Geological Survey, Tucson, Ariz.
D. K. Warren, and R. M. Turner.
Journal of the Arizona Academy of Science, Vol. 10, No. 3, p. 135-144, October, 1975. 11 fig, 1 tab, 13 ref.

Descriptors: *Tamarisk, *Riparian plants, *Seeds, *Plant growth, *Submergence, *Reproduction, Phreatophytes, Vegetation effects, Plant physiology, Resistance, Germination, Willow trees, Cottonwoods, *Arizona.
Identifiers: San Carlos Reservoir(Ariz), San Pedro River(Ariz).

Saltcedar has become established in large areas around reservoirs, streams, and rivers, notably in the arid southwest, since its introduction into the U.S. Although reasons for its replacement of native riparian species are not fully known, observations indicate that a high rate of seed production and an effective means of dissemination have, in part, led to saltcedar's rapid spread. The plant's ability to survive long periods of inundation and to reinvade as water recedes have probably been additional factors in its spread around reservoirs. Studies were conducted along the shore of the San Carlos Reservoir and on the San Pedro River in southeastern Arizona. Seed production in a dense stand of saltcedar yielded 17 seeds per square centimeter during the 5 1/2 month seed producing season. This seed production was compared with seed production in two native riparian species, seepwillow (Baccharis glutinosa) and cottonwood (Populus fremontii). The rate of establishment of saltcedar seedlings on the banks of a reservoir with receding water level corresponded closely to the rate of seed production of nearby plants. Greatest seedling establishment occurred between early May and mid-June. Mature saltcedar plants were able to survive complete submergence for as long as 70 days, and without complete submergence, up to 98 days. (Robinett-Arizona)
W76-06590

MANAGING CHAPARRAL FOR WATER AND OTHER RESOURCES IN ARIZONA,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
A. R. Hibbert, E. A. Davis, and T. C. Brown.
In: Watershed Management, Proceedings Irrigation and Drainage Division American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p. 445-468. 8 fig, 30 ref.

Descriptors: *Chaparral, *Watershed management, *Water yield improvement, *Vegetation effects, *Surface runoff, *Arizona, Livestock, Water supply, Water quality, Forages, Erosion, Revegetation, Land development, Water harvesting, Land management, Water yield, Vegetation, Grasslands, Grasses.

The chaparral vegetation type of the interior Southwest is found almost exclusively in Arizona, where it occupies some 3 to 4 million acres of rough, broken terrain in the central part of the state. While land managers rate chaparral low in commercial value, it yields about 0.1 acre-foot of good quality water per acre per year, and produces forage and browse for big game and livestock. Because of a dwindling water supply in central Arizona, conversion of chaparral to grass has been considered as a means to augment streamflow. The key to increasing water yield is replacement of deep-rooted shrubs with shallow-rooted grasses and forbs. Shrub roots ramify the entire soil mantle and can deplee the soil-water reserve to a greater extent than grasses and forbs. In previous experiments on treated watersheds, streamflow increased from 28 percent in open brush with low rainfall to more than 300 percent in dense brush with high rainfall. Conversion practices may affect water quality by temporarily increasing suspended sediment and nutrient loads, and by contamination with herbicides. It is probable that erosion will increase for a time following most conversion practices with the greatest erosion from broadcast burning and the least from mechanical and chemical control of shrubs if replacement cover is established soon after treatment. Assuming that large-scale conversion techniques can be successfully applied, and that 735,000 acres of chaparral would eventually be converted to grass, the expected downstream increase would average about 150,000 acre-feet each year. (Robinett-Arizona)
W76-06597

VEGETATION MANAGEMENT FOR WATER AND RANGE IMPROVEMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. F. Ffolliott, and D. B. Thorud.
In: Watershed Management, Proceedings Irrigation and Drainage Division American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p. 249-266. n.d. 16 ref.

Descriptors: *Watershed management, *Water yield improvement, *Surface runoff, *Vegetation effects, *Land management, Arizona, Erosion control, Forest management, Water yield, Vegetation, Range management, Coniferous forests, Ponderosa pine trees, Juniper trees, Pinyon pine trees, Chaparral, Grasslands, Desert plants, Riparian plants, Water harvesting.
Identifiers: *Vegetation management.

A review is presented of current water yield improvement experiments in Arizona in order to illustrate ways to enhance the beneficial and reduce the detrimental effects of vegetation management re-directions on water and herbage production. Seven vegetation zones are considered distinguishable for characterizing and describing water yield improvements and include mixed conifer forests, ponderosa pine forests, pinyon-juniper woodlands, chaparral vegetation zone, grassland vegetation zone, desert shrub vegetation zone, and riparian association zone. The vegetation management re-directions evaluated have potential for increased water and herbage production while reducing detrimental effects of sedimentation and erosion. It seems possible that vegetation management systems can be aimed at satisfying increasing demands for water and herbage production and also minimize the destruction of on-site resources. (Robinett-Arizona)
W76-06598

CASCADE ATMOSPHERIC WATER RESOURCES PROGRAM, VOLUME I,
Washington State Dept. of Ecology, Olympia.
P. V. Hobbs, L. F. Radke, A. B. Fraser, J. D. Locatelli, and C. E. Robertson.
Report No. VI, May 1, 1975, 306 p. 14-06-D-6999

Descriptors: *Artificial seeding, Mountains,Storms, Orographic clouds, Precipitation(Atmospheric), Snowfall, *Weather modification *Washington, *Cyclones, *Cloud seeding.
Identifiers: *Cascade Mountains(Wash).

Studies of winter cyclonic storms, orographic clouds, and precipitation over the Cascade Mountains of Washiington State are described. During the July 1970-June 1971 period simultaneous airborne, ground and radar observations were made in a number of different synoptic situations, and investigations into the effects on clouds and precipitation of seeding with artificical ice nuclei were continued. Progress was also made in developing a theoretical model to describe the flow of air over the Cascade Mountains and the growth and fall-out of precipitation from orographic clouds. (See also W76-06601 and W76-06602) (Bureau of Reclamation)
W76-06600

CASCADE ATMOSPHERIC WATER RESOURCES PROGRAM, VOLUME 2,
Washington State Dept. of Ecology, Olympia.
P. V. Hobbs, L. F. Radke, J. D. Locatelli, D. G. Atkinson, and C. E. Robertson.
Report No. VII, May 1, 1975, 293 p.

Descriptors: *Artificial seeding, Mountains, Orographic clouds, Snowfall, *Weather modification, *Washington, Precipitation(Atmospheric), *Cloud seeding.
Identifiers: *Cascade Mountains(Wash).

Detailed theoretical and field investigations are described of winter cloud and precipitation systems over the Cascade Mountains of Washington State carried out during 1971-72. Highlights include further developments of a theoretical model for orographic clouds and precipitation, results of an extensive set of measurements on the concentrations of ice particles in natural clouds, a discussion of the factors which affect the aggregation of ice particles, five case studies (two described in detail) of the effects of artificial seeding on clouds and precipitation, and a preliminary evaluation of the reliability of artificial seeding for the controlled redistribution of snowfall in the Cascade Mountains. (See also W76-06600 and W76-06602) (Bureau of Reclamation)
W76-06601

EFFECTS OF CLOUD SEEDING ON SUMMERTIME PRECIPITATION IN NORTH DAKOTA,
South Dakota School of Mines and Technology, Rapid City, Inst. of Atmospheric Sciences.
A. S. Dennis, J. R. Miller Jr, E. I. Boyd, and D. E. Cain.
Report 75-1, March 1975. 14-06-D-6660

Descriptors: Cloud physics, *Cloud seeding, Clouds, Hail, Ice nuclei, *North Dakota, Radar, Rainfall, Silver iodide, Statistics, *Weather modification, Monte Carlo method, *Precipitation(Atmospheric).

A randomized pilot project was conducted from 1969 to 1972 to test effects of cloud seeding upon growing season precipitation in western North Dakota. The principal seeding method was the operation of silver iodide generators on aircraft below cloud base. Data were collected by radar, instrumented aircraft, rain gages, and passive hail indicators. The analysis provides evidence, significant at roughly the 5% level, that silver iodide seeding of convective clouds on a determinate set of days leads to (1) an increase in the frequency of rainfall events at the target gages, (2) an increase

in the average rainfall recorded per rainfall event, and (3) an increase in total rainfall on the target. The set of days to which this evidence applies is those days with dynamic seedability, that is, days for which a cloud model predicted an increase in cloud top height under the influence of silver iodide seeding. Rainfall observations on days when the cloud model predicted no increase in cloud height show no significant differences between seed and no-seed days. The hailfall data show less hail on seed than on no-seed days but the difference is not statistically significant. (Bureau of Reclamation)
W76-06603

THE POTENTIAL FOR RAINFALL INCREASES FROM CONVECTIVE CLOUDS IN THE NORTHERN PLAINS,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
A. S. Dennis, J. H. Hirsch, D. E. Cain, J. R. Miller, Jr., and A. Koscielski.
Report 75-12, September 1975. 14-06-D-6796

Descriptors: *Model studies, Cloud physics, *Cloud seeding, Cumulus clouds, Radar, Rain, Rain gages, Silver iodide, Statistical analysis, Monte Carlo method, *Weather modification, Precipitation(Atmospheric), *North Dakota, Rainfall.
Identifiers: Northern Plains(No Dak).

Investigations using data collected during field experiments in cloud seeding over the past ten years are escribed. The sets of data used are the Cloud Catcher 10-cm radar for 1971-72, the rainfall records from the Rapid Project of 1966-68, and from the North Dakota Pilot Project (NDPP) for 1971-72, and time-lapse radar photographs obtained on the NDPP in 1972. A one-dimensional, steady-state cloud model has been used extensively in all three investigations. The 10-cm radar data from Project Cloud Catcher are analyzed for the first time in terms of individual cells rather than test cases as a whole. The Cloud Catcher cases of 1971-72 were randomly assigned to seed and no-seed categories with salt being the usual seeding agent. A comparison of 41 cells drawn from the seed population and 16 drawn from the no-seed population shows no difference in cloud depth but suggests significant differences in some other variables. The Rapid Project was a randomized crossover experiment with separate target areas for southwest and northwest flow days. Consideration was given to average daily rainfall in each target area. A study of shower echoes on the North Dakota Pilot Project for 1972 shows most of the cloud depths from 4 to 10 km. Cloud model runs suggest considerable dynamic seedability for clouds 3 to 6 km deep. (Bureau of Reclamation)
W76-06607

THE MEDICINE BOW ECOLOGY PROJECT: THE POTENTIAL SENSITIVITY OF VARIOUS ECOSYSTEM COMPONENTS TO WINTER PRECIPITATION MANAGEMENT IN THE MEDICINE BOW MOUNTAINS, WYOMING,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 5C.
W76-06610

CLOUD SEEDING TO ENHANCE SUMMER RAINFALL IN THE NORTHERN PLAINS,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
A. S. Dennis, P. L. Smith, Jr., B. L. Davis, H. D. Orville, and R. A. Schleusener.
Report No. 74-10, (1974).

Descriptors: Convection clouds, Cloud physics, *Cloud seeding, Computer models, *Cumulus clouds, Hail, Ice nuclei, Nucleation, Silver iodide, *Weather modification, *South Dakota, Water yield improvement.
Identifiers: *Northern Great Plains(So Dak).

Convective clouds are controlled by moisture supply, atmospheric instability, topographic features, and the convergence or divergence in the low level wind field. Precipitation forms in convective clouds through both the coalescence of liquid droplets and the action of frozen precipitation embryos. Both precipitation processes can be induced or modified by artificial means, the coalescence process by hygroscopic seeding, and the ice phase process by introduction of dry ice or silver iodide crystals to the supercooled portions of the cloud. Silver iodide seeding from aircraft in updrafts below cloud base using acetone generators charged with a silver iodide-ammonium iodide solution is recommended as an effective and relatively economical seeding method. Both salt and silver iodide seeding increase the horizontal extent of showers and total rainfall from them. Rainfall increases by silver iodide seeding include a component related to dynamic effects caused by the release of latent heat by artificial freezing of supercooled cloud water. (Bureau of Reclamation)
W76-06612

SATELLITE SUPPORT TO THE HIPLEX ACTIVITIES FOR 1975,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
D. W. Reynolds, T. H. Vonder Haar, J. J. Gailium, and D. W. Hillger.
Final report, December 1975. 137 p, 62 fig, 9 tab, 20 ref. USBR 14-06-D-7630.

Descriptors: Satellites(Artificial), *Weather modification, Climatology, *Kansas, *Remote sensing, *Clouds, *Climatic data, Data collections, Precipitation(Atmospheric).
Identifiers: Miles City(Kan), Colby-Goodland(Kan), Big Spring(Kan).

Final results of a cloud climatology composite developed using ATS-3 satellite imagery for three HIPLEX sites (Miles City, Colby-Goodland, Big Spring) are presented. Case study results demonstrate the usefulness of satellite data in determining cloud heights, organization, life time compared to radar, size compared to echo size, and show how satellite sounder data can extend conventional radio-sonde data in both space and time. Three years of ATS-3 satellite data were also examined and a subjective classification of mesoscale and synoptic weather features were compiled for the three HIPLEX sites and the northern, central and southern high plains. Also, five years of WBAN-10 hourly observations were analyzed and a climatological composite of both convective cloud and precipitation occurrences were compiled. These results are a preliminary look into how satellites can support the HIPLEX experiment. Digital and imagery data gathered from the SMS-2 satellite should increase knowledge of how satellites can support the HIPLEX. (Bureau of Reclamation)
W76-06613

THE IMPACT OF OVERWINTER DRAWDOWN ON THE AQUATIC VEGETATION OF THE CHIPPEWA FLOWAGE, WISCONSIN,
Wisconsin Univ., Madison. Environmental Resources Extension.
For primary bibliographic entry see Field 4A.
W76-06711

ECOLOGICAL EFFECTS OF WEATHER MODIFICATION: EFFECT OF LATE SNOWMELT ON FESTUCA IDAHOENSIS ELMER MEADOWS,
Montana State Univ., Bozeman. Dept. of Biology.
T. Weaver.
Am Midl Nat. 92(2), p346-356, 1974.

Descriptors: Ecology, Environmental effects, *Fescues, *Snowmelt, *Grasslands, *Weather modification, Ground cover, Seasonal, Soils.
Identifiers: Festuca-Idahoensis.

Diversity, cover and productivity of F. idahoensis meadows become progressively lower as one moves; from deep-soil to shallow-soil sites, or from sites that melt out in mid-May to sites that melt in late May or early June. Changes in species composition are also obvious on late melting sites. Changes associated with different melt dates are probably due to the shorter growing season of the late melting sites. Winter weather modification programs are expected to add snow, postpone melt, shorten the growing season and degrade these meadows in proportion to the amount of snow they add. Especially if the snow is deposited in drifts, the 10-15% increases in snowfall probably achievable will have small effects on the 'target area' while returns to the 'service area' might be considerable. --Copyright 1975, Biological Abstracts, Inc.
W76-06756

3C. Use Of Water Of Impaired Quality

SEED GERMINATION, RESPIRATION AND MITOCHONDRIAL EFFICIENCY OF THREE ALFALFA (MEDICAGO SATIVA L.) CULTIVARS SUBJECTED TO NACL SALINITY,
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
M. Bar-Adon.

Descriptors: *Alfalfa, *Germination, *Respiration, *Salt tolerance, *Plant physiology, Seeds, Salinity, Water quality, Salts, Saline soils, Arid lands, Crop production, Sodium chloride, Osmotic pressure.
Identifiers: *Mitochondrial efficiency, Ladak 65, Mesa-Sirsa, Salton, Respiratory control.

Salinity is one of the major factors causing yield reduction of agricultural crops in arid and semiarid regions, as low rainfall and high temperatures prevent adequate leaching of soluble salts. The germination percentage, seedling respiration, mitochondrial efficiency and respiratory control of Ladak 65, Mesa-Sirsa, and Salton alfalfa cultivars were evaluated under water potentials ranging from 0 to minus 10 bars. With increasing salt concentration, germination percentage of the three cultivars decreased; Salton had the greatest tolerance. NaCl salinity exerted both osmotic and toxic effects on the germinating seed. The highest respiration rates averaged over all salt concentrations were noted in Mesa-Sirsa which showed an increase in respiration rate when treated with minus 10 bars sodium chloride. Mitochondrial efficiency and respiratory control were polarographically measured from isolated mitochondria. At high salt concentrations both mitochondrial efficiency and respiratory control were higher than at low salt concentrations, with Ladak 65 having the highest mitochondrial efficiency and respiratory control followed by Mesa-Sirsa and Salton respectively. (Robinett-Arizona)
W76-06264

SALINITY-OZONE INTERACTIVE EFFECTS ON ALFALFA YIELD AND WATER RELATIONS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
G. J. Hoffman, E. V. Maas, and S. L. Rawlins.
Journal of Environmental Quality, Vol. 4, No. 3, p 326-331, July - September, 1975. 4 fig, 5 tab, 16 ref.

Descriptors: *Salinity, *Ozone, *Soil-water-plant relationships, *Alfalfa, Irrigation water, Saline water, *Crop production, Plant growth, Agriculture, Air pollution, Leaves.
Identifiers: Medicago sativa L. cv. Moapa, Leaf diffusion resistance.

The effect of ozone on forage yield of alfalfa (Medicago sativa L. cv. Moapa) was determined at four controlled salinity levels (NaCl and CaCl2)

having osmotic potentials of -40, -200, -400, and -600 kilopascals. For nonsaline treatments, ozone greately reduced yields when alfalfa was exposed to daily 2-hour periods of 10-20 parts per hundred million; concentrations that are prevalent in many agricultural areas. As salinity increased, ozone had less effect on yield, and a 25% greater yield was produced with salinity at moderate, but not detrimental levels. Salinity at all levels or ozone at 20 parts per hundred million increased water use efficiency of alfalfa, and low concentrations of ozone had no effect on water-use efficiency. Both ozone and salinity together were required to increase leaf diffusion resistance. (Robinett-Arizona)
W76-06269

EFFECT OF SALINE WATER IRRIGATION ON N.CO310 AND H50-7209 CULTIVARS OF SUGARCANE: II. CHEMICAL COMPOSITION OF PLANTS,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
M. M. Syed, and S. A. El-Swaify.
Trop Agric. 50(1), p 45-51, 1973.

Descriptors: *Sugarcane, *Saline water, Irrigation, Chlorides, Sea water, Sulfates, Sodium chloride, Sodium sulfate, Phosphorus, Potassium, Magnesium.
Identifiers: Cultivars, H50-7209, Sodium.

The effects of saline water irrigation on the chemical composition of 2 sugarcane cultivars were determined. Salt types NaCl, Na2SO4 and sea water affected the uptake of various elements differently. In general, the Na content was increased by all treatments, K content remained unchanged with NaCl and sea-water irrigation but decreased with Na2SO4, Ca content was reduced, most of the reduction occurring under Na2SO4 irrigation, and Mg content increased slightly with the highest content noted under sea water treatments. Analysis for anions showed that Cl content increased significantly with NaCl and sea water irrigation but decreased sharply with Na2SO4, that the converse was true for SO42- content, that P content remained essentially unchanged for N.Co.310 but increased significantly for H50-7209, and that N contents of blades were reduced under all treatments.--Copyright 1975, Biological Abstracts, Inc.
W76-06274

EFFECT OF IRRIGATION REGIMES IN RELATION TO CHLORCHOLINE CHLORIDE (CCC) APPLICATION ON WHEAT,
Cairo Univ., Giza (Egypt). Dept. of Agronomy; and Cairo Univ., Giza (Egypt). Faculty of Agriculture.
For primary bibliographic entry see Field 3F.
W76-06279

SEEDBED SOIL SALINITY AND EMERGENCE OF PEPPERS AND CARROTS UNDER SPRINKLER AND FURROW IRRIGATION,
Agricultural Research Service, Weslaco, Tex.
F. Salinas, and L. N. Namken.
J Rio Grande Val Hortic Soc. 27, p 74-80, 1973.

Descriptors: *Saline soils, *Carrots, *Sprinkler irrigation, *Furrow irrigation, Irrigation practices.
Identifiers: *Peppers.

Seedbed soil salinity levels were affected by irrigation method during the establishment of sweet peppers and carrots. Soil salinity (ECE) in the surface 2.5 cm increased from 0.6 to 11.4 mmho/cm during the summer establishment of peppers under furrow irrigation compared with an increase from 0.6 to 3.5 mmho/cm under sprinkler irrigation. Soil salinity below 2.5 cm was the same for both irrigation methods. Sweet pepper populations before thinning were 170,000, 277,000 and 412,000 plants/ha under furrow, 3-5 day sprinkler and daily sprinkler irrigation treatments, respectively. The ECE in the surface 2.5 cm of the beds after the establishment of fall carrots under furrow irrigation was 12.3 mmho/cm compared with 5.7 mmho/cm under sprinklers. Carrot populations after stand establishment irrigation were 250,000 and 288,000 plants/ha under furrow and sprinkler irrigation, respectively. --Copyright 1974, Biological Abstracts, Inc.
W76-06305

THE FUTURE OF WATER RESOURCES,
Wessex Water Authority, Bristol (England).
For primary bibliographic entry see Field 5F.
W76-06324

CHEMICAL COMPOSITION AND YIELD OF SOYBEANS AS AFFECTED BY IRRIGATION AND DEEP PLACEMENT OF LIME, PHOSPHORUS AND POTASSIUM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Agriculture.
J. A. Lutz, Jr., G. D. Jones, and E. B. Hale.
J Indian Soc Soil Sci. 21(4), p 475-483, 1973.

Descriptors: *Soybeans, Crop production, *Lime, *Phosphorus, *Potassium, Fertilizers, Irrigation.

The experiment conducted on Davidson clay loam consisted of treatment of 49 kg P/ha and 186 kg K/ha disked into the Ap layer in 1969 and 1970. Plow sole placement (30.5 cm) consisted of various rates and ratios of P and K with and without lime and micronutrients. Deep placement of lime and fertilizer did not affect the yield and quality of soybeans (Glycine max (L.) Merrill). Irrigation increased lodging, delayed maturity and significantly increased the yield of beans and hay each year. Leaf P and K, and the protein contents of beans were unaffected by irrigation. Oil content of beans was increased significantly with irrigation. Irrigation also significantly increased seed size and purple stain. The soil pH and available P, K, Ca and Mg of various soil depths were affected by lime, P and K treatments.--Copyright 1974, Biological Abstracts, Inc.
W76-06338

HYDROLOGIC EVALUATION OF SALINITY CONTROL AND RECLAMATION PROJECTS IN THE INDUS PLAIN, PAKISTAN--A SUMMARY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5G.
W76-06453

LOW DRIFT SPRAY NOZZLE,
Delavan Manufacturing Corp., West Des Moines, Iowa. (Assignee)
For primary bibliographic entry see Field 5G.
W76-06467

PRELIMINARY ENGINEERING ANALYSIS, YUMA DESALTING PLANT.
Burns and Roe, Inc., Paramus, N. J.
For primary bibliographic entry see Field 3A.
W76-06547

GROUNDWATER RESOURCES OF ALTUNKUPRI AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 4B.
W76-06576

A PROPOSAL FOR FUTURE UTILIZATION OF THARTHAR LAKE WATER,
Institute for Applied Research on Natural Resource, Baghdad (Iraq).
N. M. Ali Rashid, A. H. Al-Rawi, G. S. Toma, and R. K. Abdul-Halim.
Technical Bulletin 74, October 1974. 35 p, 4 fig, 11 tab, 14 ref.

Descriptors: *Saline water, *Irrigation water, *Water supply, *Water quality, Brackish water, Irrigation, Salinity, Water demand, Dams, Storage requirements, Water resources development, Water shortage.
Identifiers: *Tharthar Lake(Iraq), *Euphrates River, Tigris River, Habbaniya Lake(Iraq).

Construction of dams on the Euphrates river in Turkey and Syria has not only caused water shortages in the Euphrates river in Iraq, but has also increased the river's salinity. The use of Tharthar lake water, which is highly saline, has therefore become valuable for augmenting irrigation water in the central and southern parts of Iraq. However, in order to reduce the salinity hazard it was necessary to find the most suitable mixing ratio of Tharthar and Euphrates water. With respect to salinity and sulfate ion concentration, a mixing ratio of 0.25:1.00 of Tharthar to Euphrates water appears to be most suitable. Using this ratio about 6.442 billion cu m per year could be released from the lake to the Euphrates river. For flood control and during the period of October-February when irrigation demands are low, a higher mixing ratio of 0.5:1.0 is suggested. Results of chemical analysis of waters from the Tigris and Euphrates rivers and Tharthar and Habbaniya lakes indicate that water of the Tigris river has the best quality with respect to salt content, carbonates, sulfate content, and sodium adsorption ratio, followed by Habbaniya, Euphrates, and Tharthar waters. The sulfate concentration in Tharthar lake amounted to about 45 percent of the total ionic concentration. (Robinett-Arizona)
W76-06577

SOIL MOISTURE REGIME OF UNSATURATED ZONE IN SOME ARID REGIONS,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2G.
W76-06578

INVESTIGATION OF SOME PHYSICAL PROPERTIES OF THE SOILS IN THE DALMAJ PILOT PROJECT AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2G.
W76-06579

CHARACTERISTICS AND CLASSIFICATION OF TWO SOILS IN DIYALA BASIN, IRAQ,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2G.
W76-06580

DRAINAGE AND RECLAMATION PERFORMANCE AT THE IMAM EXPERIMENTAL FIELD IN THE GREATER MUSSAYEB PROJECT, A MONITORING STUDY,
Institute for Applied Research on Natural Resources, Baghdad(Iraq).
B. A. Takessian, and R. van Aart.
Technical Bulletin 79, December, 1974. 15 p, 5 fig, 3 tab, 4 ref.

Descriptors: *Drainage engineering, *Irrigation effects, *Land reclamation, *Hydraulic conductivity, *Drainage systems, Soil-water-plant relationships, Soil moisture, Drainage practices, Arid lands, Infiltration, Soil investigations, Land management, Permeability, Irrigated land, Soil physical properties, Saturated soils.
Identifiers: *Greater Mussayeb Project(Iraq).

The Greater Mussayeb Project is located about 65 km south of Baghdad and consists of some 80,000 hectares irrigated with Euphrates River water. In order to test the existing drainage systems with drain spacing of 333 m under improved farm conditions, a farm unit of 16.5 hectares, situated in a

transition zone between high levee and basin soil associations, was monitored for 3 years (1969-1972). Results indicated that under an average cropping pattern of 50 percent winter and 45 percent summer intensity the existing open drainage system was adequate to prevent water-logging and salinization of the land. Hydraulic conductivity measurements showed that to a depth of 3.5 m the soil is moderately to moderately rapid permeable with values ranging from 0.6 to 3.5 m/day and with an average of 1.5 m/day. Below 3.5 m the average permeability can be taken as 0.4 m/day. The average drainage requirement was calculated at 0.8 mm/day and the effective transmissibility was 20 sq m/day. (Robinett-Arizona)
W76-06581

EFFECT OF SALINIZATION ON CERTAIN SOIL MICROFLORA,
Institute for Applied Research on Natural Resources, Baghdad(Iraq).
For primary bibliographic entry see Field 5C.
W76-06582

SURFACE RUNOFF AND ITS EFFECT ON DIFFUSE SALT PRODUCTION FROM MANCOS SHALE MEMBERS,
Utah State University, Logan, Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2G.
W76-06583

ESTIMATING INDIRECT COST OF URBAN WATER USE,
Koebig and Koebig, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 6C.
W76-06615

STUDIES ON THE EFFECT OF SOIL DENSITY, TEMPERATURE AND FERTILIZATION OF THE SOIL MOISTURE, VALUE OBTAINED WITH A DIELECTRIC MEASURING TECHNIQUE, (IN GERMAN),
For primary bibliographic entry see Field 2G.
W76-06727

THE INFLUENCE OF HIGH SALT CONCENTRATIONS ON VARIOUS PHYSIOLOGIC PARAMTERS OF MAIZE ROOTS, (IN GERMAN),
Humboldt-Universitaet zu Berlin (East Germany). Biology Section.
W. Dreier, and H. Goering.
Wiss Z Humboldt-Univ Berl Math Naturwiss Reihe 23(6); p 641-644, 1974.

Descriptors: *Salts, Corn(Field), *Roots, Plant physiology, Salt tolerance.

Reduction of water potential by physiologically high concentrations of salt or osmotica results in an increase of endogenous osmotic potential of the root cells (Zea Mays.). This increase is due to increased ion concentration, whereas the sugar concentration decreases. Long-distance transport of assimilate is impeded by a long term incubation of the roots in salt water.--Copyright 1975, Biological Abstracts, Inc.
W76-06790

3D. Conservation In Domestic and Municipal Use

A MARGINAL COST BASIS FOR METROPOLITAN WATER SUPPLY ALLOCATION AND OPERATION,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W76-06164

WASTEWATER FLOW REDUCTION IN THE HOME,
Enviro Control, Inc., Rockville, Md.
A. Hershaft.
Journal Environmental Systems, Vol. 4, No. 3, p 217-239, Fall 1974. 3 fig, 5 tab, 51 ref.

Descriptors: *Water pollution control, *Water conservation, *Water utilization, *Recycling, Water allocation(Policy), Water supply, Water policy, Reclaimed water.
Identifiers: Household water use, Waste water flow reduction.

Of the average per capita water demand of 150 gallons per day in the US, 60 gallons are used for residential purposes, 50 in industry, 20 in commercial applications, 10 for public purposes and 10 unaccounted, not including irrigation and outdoor recreation. In order to meet the zero discharge goal of the Federal Water Pollution Act of 1972 residential water use is a prime target for conservation measures. Studies indicate that household water use can be reduced by 35% with available technology and that there is general public acceptance of devices. There are many inexpensive flow reduction devices usable on toilets. Another approach is in-house recycling of used water for a less exacting use on the theory that water quality need only be sufficient for the intended purpose. For example, laundry wastewater can be used for flushing toilets and watering lawns with some treatment for foam, suspended solids and other contaminants. Many suggestions for saving water, including ponding water for general cleaning rather than letting the spigot run, sharing a bath or shower with another family member, lowering the water level in the toilet tank by adjusting the float, etc. Education is the key to effecting savings and demonstration programs in particular are useful. Principal benefits are decreased demand for water treatment, wastewater treatment, sewer capacity, and energy generation. Costs incurred are in promotion, acquisition, installation, and operation of equipment. There may also be some loss of conveniences and freedom of action. Despite general public acceptance of water conservation in concept, there needs to be strong incentive on the part of government to overcome resistance to actually installing and using devices to reduce water use. (Smith - North Carolina)
W76-06280

WATER-SAVING DEVICES: THE STATE OF THE ART,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sharpe, and P. W. Fletcher.
DE/Journal, p 11-13, 15, October, 1975. 2 fig, 5 ref.

Descriptors: *Water conservation, Energy, Costs, Sewage, Water utilization, Efficiencies, Wastes, Reviews.
Identifiers: *Water saving devices, Energy consumption, Water heating, Waste flow.

Predictions of water needs are in need of revision because of the change in the country's energy needs. Water conservation must be practiced to alleviate this problem as well as the unnecessary treatment of large amounts of waste. Methods of water conservation, such as new pricing, universal metering, and public education, are generally only temporary solutions. Water saving devices can accomplish the same goals cheaply and without major disruptions in water use habits. The impact and cost effectiveness of various water saving devices are discussed. Studies have shown that water use reductions on the order of 20% resulted when devices were installed on resident owned dwellings. Reductions were insignificant where tenant landlord situations prevailed and in commercial establishments. Waste flow reduction efforts on infiltration-inflow correction can account for more than 30 to 40% of the sewage flow reaching the treatment plant. For on-lot sewage disposal systems, water saving devices can produce a 40% reduction in sewage flows. A 26% reduction was found when a waste water recycling system was used with septic tanks. A study showed that an estimated 560,000 barrels of oil could be saved daily with the efficient use of hot water. The increased concentrations of solids that would result from waste flow reductions could have an adverse effect on sewage systems that are designed to carry small loads, but generally this problem is thought to be insignificant. Studies have shown that water saving devices such as shower flow controls, and toilet inserts are cost effective on new and old homes. A limitation is their availability. (Pinto-FIRL)
W76-06317

REGIONAL WASTE WATER DEVELOPMENT PLAN: ANALYSIS OF EXISTING FACILITIES.
Alamo Area Council of Governments, San Antonio, Tex.
For primary bibliographic entry see Field 5D.
W76-06351

REORIENTATION OF URBAN WATER RESOURCES RESEARCH, FINAL REPORT,
Rutger-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W76-06553

REORIENTATION OF URBAN WATER RESOURCES RESEARCH, EXECUTIVE SUMMARY,
Rutger-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W76-06554

ANNUAL REPORT 1974.
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, Pa.
For primary bibliographic entry see Field 6B.
W76-06572

ENVIRONMENTAL MANAGEMENT FOR THE METROPOLITAN AREA CEDAR-GREEN RIVER BASINS, WASHINGTON, PART II: URBAN DRAINAGE.
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 6G.
W76-06573

ESTIMATING INDIRECT COST OF URBAN WATER USE,
Koebig and Koebig, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 6C.
W76-06615

METER REPLACEMENT PROGRAM PAYS FOR ITSELF,
Mankato Water and Sanitation Dept., Minn.
For primary bibliographic entry see Field 6C.
W76-06630

3E. Conservation In Industry

ENERGY AND POLLUTION CONCERNS IN DREDGING,
Army Engineer Div. South Atlantic, Atlanta, Ga.
For primary bibliographic entry see Field 5C.
W76-06183

UTILIZATION OF ANIMAL MANURES AND SEWAGE SLUDGES IN FOOD AND FIBER PRODUCTION,
Iowa State Univ. of Science and Technology, Ames. Council for Agricultural Science.
For primary bibliographic entry see Field 5D.
W76-06198

BIBLIOGRAPHY OF STUDIES ON THE DENSITY AND OTHER VOLUMETRIC PROPERTIES FOR MAJOR COMPONENTS IN GEOTHERMAL WATERS, 1928-1974,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W76-06454

AQUEOUS SOLUBILITY OF PETROLEUM AS APPLIED TO ITS ORIGIN AND PRIMARY MIGRATION,
Geological Survey, Denver, Colo. Office of Energy Resources.
For primary bibliographic entry see Field 4B.
W76-06455

PROCESS OF REMOVING AMMONIACAL NITROGEN FROM WASTE WATER,
Iwao Engineering Co., Inc., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W76-06463

GEOTHERMAL POWER SYSTEM AND METHOD,
J. S. Swearingen.
U.S. Patent No. 3,935,102, 5 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1873-1874, January 27, 1976.

Descriptors: *Patents, *Geothermal studies, *Heat flow, *Thermal conductivity, *Thermal water, Temperature, Scaling, Heat transfer, Porous media, Gravels, Heat exchangers, Water reuse.

A heat transfer medium in the form of a housing containing porous material such as a bed of gravel or other granular material is used to transfer heat from the unrefined water to clean water which is then passed through the heat exchanger. The hot unrefined water does not come in contact with the heat exchanger thus avoiding the problem of scaling or corrosion on the surfaces of the heat exchanger. In the system a volume of the hot unrefined water is passed through a housing containing porous material which pick up the heat of the water. A volume of clean water is then passed through the housing to pick up the heat from the porous material. The now heated clean water can then be passed through a heat exchanger without significant danger to the surfaces of the exchanger. The clean water can be recycled through the system many times, each time passing through the housing immediately after a volume of the unrefined water. The source of the clean water may be the unrefined water whih has been passed through the porous material. After being removed from the housing, the cooled unrefined water is delivered to a detention receptacle. Here it attains stabilization through elimination of its supersaturation and many of the impurities precipitate to the bottom of the receptacle. The liquid which is left on the top of the receptacle is substantially free of impurities to the extent that what impurities are left in the liquid are not sufficient to unduly damage the surfaces of the heat exchanger. (Sinha - OEIS)
W76-06472

STRAINING APPARATUS,
AB Celleco, Tumba (Sweden). (Assignee).
L. G. Rundqvist, and K. F. Jakobson.
U.S. Patent No. 3,935,109, 3 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1877, January 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Recycling, *Filtration, Pulp and paper industry, *Pulp wastes, Fibers(Plant), Water reuse, Recirculated water, *Separation techniques, Filters.
Identifiers: Strainers(Filters).

A straining apparatus separates the fibers from the backwater coming from a paper making machine so that the water can be re-used as spray-water. The apparatus consists of a funnel-shaped vessel with an outlet. A first strainer forms one wall of the vessel. Fiber containing liquid is sprayed on the outside of the strainer wall. A second strainer having a smaller total area covers the outlet of the vessel and is situated lower than the first strainer wall. During operation a liquid column is maintained on the inlet side of the second strainer and a free liquid surface is formed between the two strainers. The mesh openings of the second strainer are larger than the mesh openings of the first strainer but small enough so that any fibers passing through the first strainer due to rupture will obstruct the second strainer. (Sinha-OEIS)
W76-06476

METHOD FOR DETERMINING AND CONTROLLING LIQUID COOLING SYSTEM CHARACTERISTICS.
Brown and Root, Inc., Houston, Tex. (Assignee).
For primary bibliographic entry see Field 5G.
W76-06484

EFFLUENT GUIDELINES -- STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06513

TIRE AND SYNTHETIC SEGMENT OF THE RUBBER PROCESSING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06516

EFFLUENT GUIDELINES AND STANDARDS - FERROALLOYS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06518

FERROALLOY MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06519

EFFLUENT LIMITATIONS AND GUIDELINES - PRINTING INK FORMULATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06520

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06521

SOLAR ENERGY TECHNOLOGY, STATE OF THE ART, AN ANNOTATED BIBLIOGRAPHY,
Ocean Engineering Information Service, La Jolla, Calif., Energy Resources Div.
For primary bibliographic entry see Field 3A.
W76-06565

NORTHERN GREAT PLAINS RESOURCE PROGRAM, WATER WORK GROUP REPORT.
Northern Great Plains Resources Program, Denver, Colo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 150, $10.00 in paper copy, $2.25 in microfiche. Reports No. NGPRP/CD-74-200, NGPRP/CD-74-201, NGPRP/CD-74-202, NGPRP/CD-74-203, December 1974. 333 p. 19 fig., 83 tab., 4 append.

Descriptors: *Water resources, *Great Plains, *Water resources development, *Industrial water, Montana, North Dakota, South Dakota, Wyoming, Nebraska, Institutional constraints, Fossil fuels, Water utilization, Surface waters, Groundwater, Interstate compacts, Water rights, Water supply, Streamflow, Recreation, Wild rivers, Alternative planning, Competing uses, Indian reservations, Beneficial use, Strip mines, Consumptive use, Water costs.
Identifiers: *Northern Great Plains, *Coal gasification, Water pollution potential.

The surface water of the Upper Missouri River Main Stem and the Yellowstone Basins, and the groundwater resources in Montana and Wyoming, are analyzed in relation to the development of coal resources. The constraints to water resources development are discussed with particular reference to state water laws, policies, administration, and interstate compacts. Also considered are federal constitutional and statutory provisions, and Indian water rights. The potential for water resources development is based on availability and uses by coal-fired powerplants and coal gasification plants. Alternative plans for water supply for coal development are projected at a base level, most probable level, and extensive level, and include considerations of availability and cost of groundwater. Impacts of water use for coal development at the projected levels as related to reservoir operation, streamflow, navigation, recreation, fisheries, and water quality are evaluated as are the effects of strip mining on groundwater. The costs of storage and water transmission facilities are estimated for powerplants and gasification plants in North Dakota, Montana, and Wyoming. The recreation and aesthetic value of the rivers in the region are described and what constraints should be imposed on the existing and proposed mineral and industrial development in order to maintain their quality are detailed. (Auen-Wisconsin).
W76-06616

AN ECONOMIC ANALYSIS OF GEORGIA'S MARINE CHARTER BOAT FISHING INDUSTRY,
Georgia Univ., Athens. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W76-06624

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR THE ASBESTOS INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-06626

YBBARPSAN-A SMALL RECEPTACLE FOR A LARGE INDUSTRY: WATER CONSERVATION ACTION IN THE VICINITY OF PERSTORP AB, (IN SWEDISH),
For primary bibliographic entry see Field 5D.
W76-06732

3F. Conservation In Agriculture

SOCIOECONOMIC ANALYSIS OF A MAJOR REHABILITATION OF IRRIGATION AND

WATER MANAGEMENT SYSTEMS IN EASTERN IDAHO,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
J. R. Busch, K. H. Lindeborg, G. D. Galinato, J. E. Milliner, and M. B. Ali.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-251 544, $4.00 in paper copy, $2.25 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, June 1975. 31 p, 3 fig, 19 tab, 5 ref. OWRT B-028-IDA(4) B-033-IDA(5). 14-31-0001-3878, 14-01-0001-4077.

Descriptors: *Irrigation Practices, Distribution Systems, Sprinkler Irrigation, Furrow Irrigation, Border Irrigation, *Irrigation Efficiency, Economics, *Replacement Costs, Irrigation districts, *Idaho, *Water management(Applied), *Rehabilitation.
Identifiers: Jefferson County(Idaho), North Rigby Irrigation District(Idaho), Snake River Fan(Idaho).

High water tables caused by overuse of irrigation water have created physical and socioeconomic problems in some areas of southeastern Idaho. In one area, the Snake River Fan of Jefferson County, the irrigation systems and management practices were investigated to determine their contribution to the high water table problem. The investigations showed that the present systems are quite inefficient due to soils with high water intake rates, long irrigation runs and duplication of many irrigation canals. Engineering and economic analyses were made to determine the least cost method of rehabilitating the present system and to determine the capability of the area to support various rehabilitation schemes. Both analyses utilized linear programming models to determine optimum solutions subject to various social and legal constraints. The results obtained indicate that present practices are the most economical for the present cost and availability of water. Wells equipped with high head pumps supplying sprinkler systems appear to be the best alternative if a marked increase in overall irrigation efficiency is to be achieved. Farm sizes of 160 acres or more would be necessary to produce enough net income to support any major rehabilitation scheme.
W76-06161

INSTITUTIONAL RATIONING OF CANAL WATER IN NORTHERN INDIA: CONFLICT BETWEEN TRADITIONAL PATTERNS AND MODERN NEEDS,
California Univ., Davis. Dept. of Agricultural Economics; and California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 6D.
W76-06235

EFFECTS OF FERTILIZATION AND IRRIGATION ON YIELD AND POTASSIUM CONTENT OF ALFALFA AND ON AVAILABLE SOIL POTASSIUM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
G. D. Jones, J. A. Lutz, Jr., and E. B. Hale.
Commun Soil Sci Plant Anal. 5(3): 155-163. Illus. 1974. (In Engl. with Engl. summ.).

Descriptors: *Alfalfa, *Fertilization, *Effects, *Nutrient requirements, *Irrigation effects, *Plant growth, *Potassium, Soil chemistry, Crop production, Crops, Field crops.
Identifiers: Medicago-Sativa.

Alfalfa (Medicago sativa) yields were determined for 5 yr on Davidson clay loam at Orange, Virginia. The effects of irrigation and K application on the yield and chemical composition of alfalfa and on the available soil K content were determined. Seven rates of K were applied annually. The available K content of the 0-15 cm soil depth gradually decreased on irrigated and non-irrigated plots when 0, 93 and 186 kg K/ha were applied. Available soil K increased over 100% when 556 kg K/ha was applied. Possibly because of leaching, the decrease in available soil K in the 0-15-cm depth of plots treated with 0 and 93 kg K/hawas sligtly greater on irrigated than on non-irrigated plots. Where K was applied, considerably more available Kwas presented in 1973 in the profile of irrigated plots than in non-irrigated plots. The K concentration of the alfalfa was unaffected by irrigation but was increased with added K during the last 3 yr. Alfalfa yields were increased each year with irrigation but there was no response to K fertilization.--Copyright 1975, Biological Abstracts, Inc.
W76-06243

DROUGHT AND AGRICULTURE,
World Meteorological Organization, Geneva. (Switzerland).
For primary bibliographic entry see Field 2B.
W76-06265

EFFECTS OF WATER STRESS ON LEAF RESPIRATION, TRANSPIRATION RATES IN THE DARK AND CUTICULAR RESISTANCE TO WATER VAPOR DIFFUSION OF TWO CORN INBREDS,
Laval Univ., Dept. of Phytotechnie, Quebec.
For primary bibliographic entry see Field 2D.
W76-06266

SALINITY-OZONE INTERACTIVE EFFECTS ON ALFALFA YIELD AND WATER RELATIONS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.
W76-06269

EFFECT OF IRRIGATION REGIMES IN RELATION TO CHLORCHOLINE CHLORIDE (CCC) APPLICATION ON WHEAT,
Cairo Univ., Giza (Egypt). Dept. of Agronomy; and Cairo Univ., Giza (Egypt). Faculty of Agriculture.
A. H. El-Hattab, and A. F. Ibrahim.
Z Acker- Pflanzenbau. 139(1), p 71-81, 1974.

Descriptors: *Irrigation practices, *Wheat, Chlorides, Spraying, Crop production, Crop response, Fertilizers.
Identifiers: *Chlorocholine chloride, Spikes.

The application of irrigation regimes (number and time), CCC spraying at different growth stages of wheat cultivar 'Giza 155,' and their interaction under 60 kg N/feddan was investigated in both 1971 and 1972 seasons. Increasing the number of waterings (6 times) induced elongation of plant height, leading to lodging of wheat plants compared to 3 and 4 irrigations. Number of tillers and spikes per plant were not generally affected by the various irrigation regimes. The total yield, straw and grain was rather high under 6 waterings in both seasons. However, the grain yield under 3 times of irrigation in 1972 showed an obvious increase over the other 2 regimes. With regard to CCC-treatments, a reduction in stem height was observed when CCC was sprayed either at the 8-leaf stage or after primordial initiation in 1972 season. In addition, an obvious increase in grain yield was obtained in 1972 under all CCC-times of application, particularly when it was applied after primordial initiation. Concerning the interaction between watering regimes and CCC-time of application, CCC generally reduced stem height especially under average moisture conditions when it was sprayed after primordial initiation. Accordingly, an increase in lodging resistance of the CCC-treated plants under all water regimes was recorded. Moreover, grain yield increased when CCC was sprayed after primordial initiation under water stress. This increase was linked by an increase in number of tillers and spikes per plant, 1000 grain weight and the degree of lodging resistance.--Copyright 1974, Biological Abstracts, Inc.
W76-06279

WATER USE, ENERGY BALANCE AND GROWTH OF MAIZE AT SAMARU, NORTHERN NIGERIA,
Institute for Agricultural Research, Zaria (Nigeria).
J. M. Kowal, and A. H. Kassam.
Agric Meteorol. 12(3), p 391-406, 1973.

Descriptors: *Water utilization, *Energy, *Corn(Field), Africa, Growth rates, Transpiration, Soils, Crop production, Climates.
Identifiers: *Nigeria, Samaru.

Energy and water budget of maize crop grown in a dry sub-humid climate of northern Nigeria were assessed and related to crop performance. The pattern of crop water requirement during the growing season was well matched to the pattern of crop water availability. The period of maximum water requirement by the crop occurred when the leaf area index was greater than 2.1 and coincided with the period when the amount and frequency of rainfall was greatest. However, under the prevailing climatic conditions, with potential evapotranspiration rates of 4-6 mm per day, the crop may experience water stress, if there is no rain for a period of 5 days or more. The rate of crop growth was drastically reduced when soil-water potential decreased below -0.5 bar. The total water used by the crop during 117 days from sowing to harvest was 486 mm, of which 345 mm transpired through the plants. Crop water use efficiency was 353 g of water per g of dry matter. The crop yielded 7284 kg ha-1 of grain and 19,180 kg ha-1 of total dry matter. The efficiency of energy conversion for the season was 1.4% of the total incident radiation, while during the period of active growth the energy conversion was 2.4%.--Copyright 1974, Biological Abstracts, Inc.
W76-06298

SEEDBED SOIL SALINITY AND EMERGENCE OF PEPPERS AND CARROTS UNDER SPRINKLER AND FURROW IRRIGATION,
Agricultural Research Service, Weslaco, Tex.
For primary bibliographic entry see Field 3C.
W76-06305

EFFECTS OF NITROGEN, POTASSIUM AND IRRIGATION ON YIELD AND QUALITY OF LEMON,
Agricultural Research and Education Center, Lake Alfred, Fla.
R. C. J. Koo, T. W. Young, R. L. Reese, and J. W. Kesterson.
J Am Soc Horti Sci. 99(4), p 289-291, 1974.

Descriptors: *Nitrogen, *Potassium, Irrigation practices, Citrus fruits, *Lemons, Crop production.

Yields and quality were compared on young bearing 'Bearss' lemon (Citrus limon L.) trees grown with 3 rates of N and K and 2 levels of soil moisture over a 4-yr period. Increased rates of N application increased fruit production, incidence of fruit with scab, and green fruit; and decreased acid content of juice. K applications increased the acid content of juice. Irrigation increased fruit size and decreased the number of green fruit after curing. A leaf N content of 2.2-2.6% is suggested for optimum fruit production for 'Bearss' lemon under Florida conditions.--Copyright 1974, Biological Abstracts, Inc.
W76-06314

CHANGES IN CLIMATE AND ESTIMATED EVAPORATION ACROSS A LARGE IRRIGATED AREA IN IDAHO,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W76-06406

CASE STUDY: FOR THE ANALYSIS OF WATER MANAGEMENT INVESTMENTS ON HAND OF THE EXAMPLE OF THE KISKORE RIVER BARRAGE AND ITS IRRIGATION SYSTEMS,
For primary bibliographic entry see Field 4A.
W76-06427

ANTI-RUN AHEAD SYSTEM FOR TRAVELING HOSE PULL SPRINKLERS,
Heinzman Engineering, Inc., Grand Island, Nebr. (Assignee).
J. C. Groelz, and J. W. Heinzman.
U.S. Patent No. 3,934,819, 4 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 942, No. 4, p 1788, January 27, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation systems, *Irrigation practices, Lateral conveyance structures, Application equipment.
Identifiers: Mobile irrigation devices, Brakes.

Some mobile irrigation devices utilize large capacity high pressure irrigation guns which oscillate and are rearwardly directed and at the start of a run of the mobile irrigation device along a field the reactionary forces applied to the sprinkler as a result of the rearward discharge of irrigation water tends to overcome rolling resistance of the wheels and the frictional drag of the initial short length of hose being dragged behind the irrigation device with the result that the device tends to move along the field at a rate faster than that which would be determined by the cable being wound on the winch. The mobile irrigation device of this invention is equipped with a chain drive for driving the winding drum for the cable along which the irrigation device pulls itself. The wheels of the device are provided with fluid pressure actuated brakes and tension sensing structure is provided for sensing the taut reach of the driving chain and connected to a control valve interposed in a high pressure fluid line extending from the high pressure irrigation water supply to the brake actuator. Thus, should the tension of the taut reach of the driving chain be reduced below a predetermined minimum the brakes of the mobile irrigation device are applied to prevent a 'run ahead' condition. (Sinha - OEIS)
W76-06465

SPRINKLER CONTROL,
Telsco Industries, Dallas, Tex. (Assignee).
C. W. Phaup.
U.S. Patent No. 3,934,820, 8 p, 7 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1788, January 27, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Application equipment.
Identifiers: Pop-up sprinklers.

A pop-up sprinkler system protected from accumulation of debris, from interference with adjustable controls, and from operational difficulties caused by complicated mechanisms and unregulated pressure heads is described. The invention comprises an outer housing, a rotatable nozzle head vertically movable through an outer housing cover, and an inner housing attached to the nozzle head and slidably received within the outer housing. Enclosed within the inner housing is an impeller driven transmission with a speed-reducing gear train isolated from the flow of water, a manually adjustable by-pass throttle to control the flow velocity of water driving a water-wheel impeller, and an accurate and greatly simplified direction controlling mechanism to control the location and size of an arc sector over which water is to be discharged. As the inner housing is accessible only when the sprinkler head is inoperative and the outer housing cover has been removed, problems associated with easily accessible adjustment controls are minimized. Under the pressure of water applied to an outer housing water inlet, the nozzle head and inner housing overcome the compressive force of a spring to assume a fully extended position in sealing contact with the outer housing. The flow of water between the water inlet and a drive tube attached to the nozzle head is essentially restriction free to minimize pressure drop across the transmission. (Sinha - OEIS)
W76-06466

IRRIGATION SYSTEM WATER EMITTER,
D. Fitzhugh.
U.S. Patent No. 3,934,824, 4 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1789, January 27, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Application equipment, Distribution systems, Water distribution(Applied).
Identifiers: Drip irrigation, Water emitters.

A water emitter is provided for drip irrigation systems which can be modified at the irrigation site to accommodate variations in pressure in differing areas in the specific configuration or layout of system used, and the typography of the land to be irrigated. The emitter includes a flexible, collapsible thermoplastic or elastomeric emitter tube, having a number of spaced-apart crimps. The crimps serve to close the emitter tube when no water is supplied, and to provide a sinuous path for water, thus increasing friction and controlling pressure at each emitter in the system. The length of each emitter and, therefore, the number of crimps can be selected according to the desired pressure at each emitter site along the system. Also included with each emitter is an elongated, relatively rigid protective tube to prevent soil compaction of the emitter in its collapsed non-functioning state. (Sinha - OEIS)
W76-06468

THE EFFICIENT USE OF UTAH'S IRRIGATION WATER: INCREASED TRANSFERABILITY OF WATER RIGHTS,
Utah Univ., Salt Lake City. Coll. of Law.
M. H. Anderson.
Utah Law Review, Vol. 1975, p. 158-78 Spring 1975. 21 p, 1 dwg.

Descriptors: *Water rights, *Water resources development, *Utah, *Irrigation efficiency, Irrigation practices, *Irrigation programs, Irrigation operation and maintenance, Irrigation engineering, Irrigation design, Irrigated land, Irrigable land, Irrigation districts, Water control, Water districts, Water delivery, Water distribution(Applied), Water allocation(Policy), Water conservation, Water users, Water yield improvement.
Identifiers: *Mutual water companies.

Utah's economic well-being depends upon the adequacy of its water supply. It is essential that existing water supplies be used as efficiently as possible. Irrigation water is almost entirely distributed through organized irrigation entities such as mutual water companies, in which shareholders receive proportionate shares of the corporation's water supply in lieu of dividends, and public agencies, where distribution is either by state irrigation and water conservancy districts or by federal Bureau of Reclaimation contracts. Increased efficiency in water use can be achieved through changes in water resource allocation arising through alteration of existing laws and practices. Enhancing the marketability of irrigation water through suggested changes could provide the needed efficiency. Suggested changes include: (1) state encouragement of mutual water companies; (2) state legislation awarding compensation to water users injured by a proposed water transfer; (3) abolition of mutual water companies' restrictions upon transferability of water among shareholders; and (4) abolition of the required Bureau of Reclaimation's consent to a water transfer when repayment of federal loans have been previously arranged. (Welch-Florida)
W76-06487

ACROLEIN RESIDUES IN IRRIGATION WATER AND EFFECTS ON RAINBOW TROUT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 5C.
W76-06563

DRAINAGE AND RECLAMATION PERFORMANCE AT THE IMAM EXPERIMENTAL FIELD IN THE GREATER MUSSAYEB PROJECT, A MONITORING STUDY,
Institute for Applied Research on Natural Resources, Baghdad(Iraq).
For primary bibliographic entry see Field 3C.
W76-06581

COSTS ARE SOARING: IRRIGATING FROM THE UNDERGROUND,
Arizona Univ. Tucson. Dept. of Agricultural Economics.
G. S. Willett, and S. Hathorn Jr.
Progressive Agriculture in Arizona, Vol. 27, No. 5, p 1-5, September-October, 1975. 2 tab.

Descriptors: *Arizona, *Pumping, *Irrigation practices, *Electric power costs, *Economic impact, Groundwater mining, *Water costs, Irrigation, Costs, Crop production, Agriculture, Farm prices.

Arizona is the only state that relies totally on irrigation for crop production. Groundwater is used for 52 percent of all harvested cropland in Arizona, and water pumps for irrigation use 13.2 percent of the energy used by agriculture in the state. Depending on the crop grown, as of 1975 energy cost accounts for 18 to 32 percent of the total costs of producing major central Arizona field crops. As pumping costs rise, there will be a drastic change in the method and type of crop production. Improved and efficient irrigation will be more widely practiced and higher value crops will be grown. As it costs more to pump, land value will fall, the number of farm failures will increase, and the trend toward larger and fewer farms will continue. (Robinett-Arizona)
W76-06586

THE ECONOMICS OF CONVERTING NATURAL GAS-POWERED IRRIGATION PUMPS TO ALTERNATE ENERGY SOURCES IN SOUTHEASTERN ARIZONA,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
G. S. Willett, S. Hathorn Jr., C. E. Robertson, and C. G. Page.
Report No. 5, May, 1975. 55 p, 2 fig, 27 tab, 14 ref.

Descriptors: *Economic impact, *Natural gas, *Irrigation, *Alternative costs, *Pumping, *Electric power costs, Water costs, Costs, Construction costs, *Arizona, Irrigation, Groundwater mining, Pumps, Farm prices.
Identifiers: Cochise County(Ariz).

According to current estimates approximately 2,181 pumps in Arizona utilize natural gas engines, representing about 30 percent of the irrigation power units in the state. Use of natural gas for irrigation is particularly important in Cochise County where 1,256 pumps use this fuel. Converting an existing natural gas power plant to electricity will

require an investment between $10,408 and $15,627 and conversion to diesel will cost between $14,333 and $15,520. In terms of added pumping costs, conversion from natural gas to electricity will add $11.50 to $15.50 to the total cost of pumping an acre-foot of water, and conversion to diesel will add an additional $11.71 to $14.99 per acre-foot. (Robinett-Arizona)
W76-06588

THE RATIONALE OF NOMAD ECONOMY,
Uppsala Univ. (Sweden).
For primary bibliographic entry see Field 4C.
W76-06591

DESERTIFICATION: A WORLD PROBLEM,
Worldwatch Inst., Washington, D.C.
For primary bibliographic entry see Field 4C.
W76-06592

CORRECTIVE TAXES FOR POLLUTION CONTROL: AN APPLICATION OF THE ENVIRONMENTAL PRICING AND STANDARDS SYSTEMS TO AGRICULTURE,
California Univ., Santa Cruz. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-06618

A SOCIO-ECONOMIC EVALUATION OF ALTERNATIVE WATER MANAGEMENT POLICIES ON THE RIO GRANDE IN NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
For primary bibliographic entry see Field 6B.
W76-06644

LOCALIZATION OF DAMAGE INCURRED DURING WATER IMBIBITION BY PISUM SATIVUM AND ZEA MAYS SEEDS, AS REVEALED BY THE TOPOGRAPHIC TETRAZOLIUM TEST,
Scottish Horticultural Research Inst., Invergowrie.
For primary bibliographic entry see Field 2I.
W76-06649

AGRICULTURAL DROUGHT OF 1972 KHARIF SEASON,
Meteorological Office, Poona (India).
For primary bibliographic entry see Field 2B.
W76-06681

USING EVAPORATION VALUES FROM EVAPORATION PANS TO ESTIMATE THE WATER CONSUMPTION OF AGRICULTURAL PLANTS AS THE BASIS OF SPRINKLER IRRIGATION CONTROL, (IN GERMAN),
For primary bibliographic entry see Field 2D.
W76-06729

EVAPORATIVE COOLING OF 'DELICIOUS' APPLES: THE ECONOMIC FEASIBILITY OF REDUCING ENVIRONMENTAL HEAT STRESS,
North Carolina State Univ., Raleigh. Dept. of Horticultural Science.
C. R. Unrath, and R. E. Sneed.
J Am Soc Hortic Sci. 99(4), p 372-375, 1974.

Descriptors: *Apples, Fruit crops, *Evaporation, Cooling, *Irrigation, Temperature, Feasibility, Economic feasibility, *Thermal stress.
Identifiers: *Evaporative cooling(Fruit).

The response of 'Red Delicious' apples to low volume overtree evaporative cooling (EC) irrigation was studied over a 4-yr period from 1969-72. While the amount of thermal load and irrigation system run-time varied from year to year, EC consistently resulted in fruit temperature averaging 5.6 degrees C (10.1 degrees F) for the entire 509 h the system operated over the 4-year period. In each of the 4 yr, EC improved fruit quality; on the average increasing total reddish color 8%, solid red color 13%, soluble solids 1%, and fruit weight 22-g while reducing corking 8% and bitter pit 7%. The additional fruit coloration stimulated by EC concentration harvest in the earlier portion of the harvest season. During the 4 yr of the experiment, an additional 1/3 of the cooled crop was harvested, with sufficient solid red color to meet 'extra fancy' U.S. grade, during the 1st 2 wk of the seasons. Because of higher early-season prices, the concentrated earlier harvest of EC fruit is of considerable economic benefit. In locations where heat stresses are common, the use of EC and soil irrigation should be economically feasible.--Copyright 1974, Biological Abstracts, Inc.
W76-06791

IRRIGATION OF FIELD TOMATOES AND MEASUREMENT OF SOIL WATER CHANGES BY NEUTRON MODERATION METHODS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
G. H. Cannell, and C. W. Asbell.
J Am Soc Hortic Sci. 99(4), p 305-308, 1974.

Descriptors: *Irrigation, *Tomatoes, Soil water, Measurement, Soil moisture, Fruit crops, Crop production, Roots.
Identifiers: Lycopersicon-Esculentum, *Neutron moderation methods.

Irrigation studies with processing tomato, Lycopersicon esculentum, cv. VF-145-21-4, showed a highly significant yield increase with increased soil moisture. Total number of fruit (fruit set) was not significantly different with irrigation treatments. Yield differences were largely attributed to small ripe and green fruit, unacceptable for processing, that resulted from soil moisture stress in drier treatments. Soil water volume changes between irrigations were measured in the soil profile using neutron moderation equipment. The total volume of water measured during the season was compared to that applied for each irrigation treatment. With exception of the wet treatment in 1971, agreement between comparisons was within plus or minus 3%. Root growth with depth plotted as a function of time (season) was essentially the same for all irrigation treatments.--Copyright 1974, Biological Abstracts, Inc.
W76-06793

FLOODING EFFECTS ON LIGHT REFLECTANCE, TRANSMITTANCE, AND ABSORPTANCE OF COTTON (GOSSYPIUM HIRSUTUM) LEAVES,
Agricultural Research Service, Weslaco, Tex.
For primary bibliographic entry see Field 2I.
W76-06794

INFLUENCE OF WATER STRESS AND GROWTH REGULATOR APPLICATIONS ON SUGAR COMPOSITION OF SOYBEAN LEAVES,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 2I.
W76-06796

EFFECT OF DIFFERENT FREQUENCIES OF IRRIGATION ON GRANULATION IN SWEET ORANGE (CITRUS SINENSIS OSBECK),
Himachal Pradesh Univ., Haryana (India). Dept. of Horticulture.
R. P. Awasthi, and J. P. Nauriyal.
J Res Punjab Agric Univ. 10(3), p329-330, 1973.

Descriptors: *Irrigation, Asia, *Crops productivity, Citrus, *Oranges.
Identifiers: India.

Studies on the effect of different frequencies of irrigation comprising 7-14-21- and 28-day intervals on granulation were carried out on Mosambi orange at the Regional Fruit Research Station, Abohar (Maia), during 1966 and 1967. Different frequencies of irrigation failed to show any significant differences in the 1st year, but during the 2nd year, irrigation at 14-day interval gave a significantly lower incidence and extent of granulation than other treatments. --Copyright 1974, Biological Abstracts, Inc.
W76-06797

THE EFFECT OF IRRIGATION ON THE LENGTH, WEIGHT AND DIAMETER OF LETTUCE ROOTS,
National Vegetable Research Station, Wellesbourne (England).
H. R. Rowse.
Plant Soil. 40(2), p381-391, 1974.

Descriptors: *Irrigation, *Lettuce, *Growth rates, Growth stages, Roots.

The total fibrous-root length of mature field-grown lettuce protected from rainfall and not irrigated after establishment was less than 75% of that of irrigated plants, although the corresponding root weights were very similar. Non-irrigated plants had thicker roots, less roots near the soil surface, and more at depth. up to the time that the roots started to die, about 2 wk before the lettuce were mature, the variation of root length with depth and time is described by a simple logarithmic expression. --Copyright 1974, Biological Abstracts, Inc.
W76-06798

VARIETAL RESPONSE OF PEAS TO IRRIGATION AND INTERROW SPACING,
Haryana Agricultural Univ., Hissar (India). Dept. of Agronomy.
H. C. Sharma, and K. P. Singh.
Haryana Agric Univ J Res. 3(1), p1-4. 1973.

Descriptors: *Irrigation, *Peas, *Crop response, Crop production.

A field experiment was conducted to study the response of 2 cultivars of pea, 'T 163' and 'T 19', to 2 row spacings, 30 and 45 cm and 4 irrigation treatments, irrigating at pre-flowering stage; at post-flowering stage; at pre- and post-flowering stages and at preflowering, flowering, and post-flowering stages. 'T 163' gave 38% significantly higher yields of grain than 'T 19'. A single irrigation at pre-flowering or post-flowering was sufficient for raising a good pea crop. --Copyright 1974, Biological Abstracts, Inc.
W76-06799

CORRELATION BETWEEN SOWING TIME AND WEATHER FACTORS ON THE INTENSITY OF GROUNDNUT DISEASES,
Agricultural Research Station, Madras (India).
H. D. Lewin, S. Natarajan, and K. Govindarajan.
Indian J Mycol Plant Pathol. 3(1), p26-32, 1973.

Descriptors: *Plant diseases, Crop response, Crop production, Temperature, Weather, Rainfall intensity.
Identifiers: Arachis-Hypogaea, Cercospora-Arachidicola, Cercospora-Personata, *Groundnut diseases.

Early sowings of groundnut (Arachis hypogaea) done at 2-4 wk intervals from 7th June to 22nd July recorded significantly less incidence of 'tikka' disease (Cercospora personata and C. arachidicola) and higher yields. Sowing on 5th Sept. gave the lowest yield and a high incidence of 'tikka'. Both the time of sowing and 'tikka' incidence were negatively correlated with yield. 'Tikka' incidence was positively correlated with rainfall and negatively correlated with temperature. --Copyright 1974, Biological Abstracts, Inc.
W76-06800

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

ECONOMIC AND LEGAL ANALYSIS OF ALTERNATIVE FLOOD CONTROL STRATEGIES: PHASE I,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6F.
W76-06159

DRAINAGE RATES FROM A VERTICAL COLUMN,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2F.
W76-06165

ROLE OF BOGS IN THE FORMATION OF SPRING FLOOD RUNOFF LOSSES IN THE DRAINAGE BASINS OF THE NORTHWESTERN EUROPEAN USSR,
O. I. Krestovskiy, and S. B. Dribizova.
Soviet Hydrology, Selected Papers, No. 1, p 43-51, 1974. 3 fig, 4 tab, 12 ref, 1 append. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 214, p 257-270, 1974.

Descriptors: *Bogs, *Runoff, *Floodwater, *Europe, Saturated soils, Wetlands, Snowmelt, Water storage, Soils.
Identifiers: *USSR, *Spring flood runoff.

The storage capacity of bogs and waterlogged depressions and the dynamics of their storage fluctuations were investigated, and the meltwater losses resulting from the filling of the bogs in spring were determined for the drainage basins of the northwestern European USSR. The amount of water stored in bogs on the date of the end of each spring flood is almost equal to the long-period mean value. There are virtually no spring water losses due to the filling of bogs and only in some years do they reach 10-15 mm with respect to a 20% waterlogged drainage basin. The water absorption capacity of bogs and waterlogged depressions (moisture deficit) is about 100 mm. The moisture deficit in bogs is determined in relation to the long-period mean bog storage on the date of the end of intense spring flood runoff. The value of the moisture deficit is used to compute the possible flood water losses associated with the filling of the bogs. The fluctuations in bog storage are close in magnitude to and synchronous with the fluctuations of the moisture content in the upper 50 cm of the soil. Therefore, in the absence of observations of water levels in bogs, the fluctuations in their storage can be taken into account on the basis of soil moisture observations. (Sims-ISWS)
W76-06175

SOME CHARACTERISTICS OF THE PROCESS OF INCOMPLETE MEANDERING OF THE CHANNEL OF THE UPPER OB' RIVER,
N. M. Kulemina.
Soviet Hydrology, Selected Papers, No. 6, p 518-534, 1973. 3 fig, 5 tab, 7 ref. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 209, p 4-24, 1973.

Descriptors: *Meanders, *Geomorphology, *Rivers, Erosion, Banks, Braiding, Channels, Flood plains, Stream erosion, Cutoffs, Hydroelectric plants, Bridges, Sedimentation, sediments.
Identifiers: *Ob' River(USSR), *USSR.

An investigation in a reach of the Upper Ob' River of channel and floodplain formation, based on the hydromorphological theory of the channel process, revealed some new patterns of incomplete meandering. The reach with incomplete meandering, i.e., a channel process typical of rivers with severely flooded and relatively easily eroded flood plains, is about 300 km long, starting 60 km upstream of Barnaul city and ending at Kamen'-na-Obi city, where the valley is confined by the outliers of the Salair Ridge. Another type of channel process, the midstream bar or channel braiding process, which gradually changes to incomplete meandering, is developed over a 200-km stretch upstream of the foregoing reach. Groups of meanders with a high degree of development are straightened by a shorter cutoff, whose development is accompanied by an increase in the rates of meandering and by the lengthening of the channel downstream of it. Therefore, 50-60 years later, the decrease in the length and degree of development of meanders in the reach with the cutoff are compensated by the lengthening and an increase in the development of meanders downstream of it. In this case, meanders develop particularly rapidly in the downstream part of the straightening cutoff, where the highest rates of bank movement reach 100 m/yr. (Sims - ISWS)
W76-06178

LEVEL OF CLOSED BODIES OF WATER AS ONE OF THE CRITERIA OF GLOBAL WATER EXCHANGE,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2A.
W76-06179

OPTIMUM DREDGED DEPTH IN INLAND WATERWAY,
CACI, Inc., Arlington, Va.
For primary bibliographic entry see Field 2J.
W76-06182

WATER AS A FOREST PRODUCT,
New Zealand Parks and Reserves, New Plymouth.
A. D. Jellyman.
N Z J For. 18(2), p 211-216, 1973.

Descriptors: Water, Forests, *Forest management, *Land management, Land use, *Water resources, *Water management(Applied).

Land management is a crucial factor in preserving water resources and, since water is a limited resource, it will require good management practices including promotion of methods to reduce loss and wasteful use. Foremost in all future considerations of water development will be the principle of multiple use. For this to be effective, coordination and co-operation of all water users will be required to ensure that the maximum benefits are obtained from any development. The whole concept of present agricultural topdressing programs should be investigated both for economic reasons and to mitigate the problems of nutrient enrichment of waters. There is need for an urgent review of subsidy rates so that more land can be protected for posterity, and there is a need for greater emphasis on the planting of protective and productive forests for sound economic reasons as well as for conservation purposes.--Copyright 1974, Biological Abstracts, Inc.
W76-06200

INVESTIGATIONS OF AQUATIC WEED CONTROL METHODS AND THEIR ENVIRONMENTAL EFFECTS ON NONTARGET AQUATIC SPECIES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
N. E. Otto.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-240 191, $4.50 papper copy, $2.25 in microfiche. Report No. REC-ERC-74-11, November 1974. 54 p. 9 fig., 13 tab., 31 ref., 2 append.

Descriptors: *Herbicides, *Aquatic weed control, *Effects, *Biological communities, Colorado, Algal control, Diatoms, Invertebrates, Standing crops, Biomass, Irrigation ditches, Canals, Metabolism, Productivity, Copper sulfate, Bioindicators, Performance, Copper compounds, Analytical techniques, Diquat.
Identifiers: Adenosine triphosphate, Monochlorotoluene, Xylene, Acetamide-methylurea compound.

Diatom and macroinvertebrate populations, water quality and biological data, standing crop biomass, and adenosine triphosphate levels were studied in Colorado irrigation ditches. Population data showed few differences between canals treated or untreated with herbicides. Canals treated with copper sulfate-xylene showed species diversity declines but recovered rapidly after treatment stopped. Macroinvertebrates decreased after xylene treatment, returned four days after treatment, and reached previous diversity levels in one month; diatoms recovered more slowly. Relationships between taxa diversity indices and standing crop biomass were more significant for diatoms than macroinvertebrates. Nitrate-nitrogen was higher in canals with weed growth. Taxa type and community structure were indicators of canal-river habitats. Adenosine triphosphate was not a reliable indicator of living biomass; however gravimetric biomass determination may be less sinsitive than metabolic adenosine triphosphate in determining biological productivity. Species diversity indices and chemical and physical water analyses can indicate if pesticides are harming the habitat. Evaluation of an experimental acetamide-methylurea compound and monochlorotoluene indicated that they were herbicidal to pondweeds. A mixture of three soluble copper compounds with diquat had more herbicidal activity than copper sulfate-diquat. Studies of herbicide effects or adenosine triphosphate levels on pondweeds and algae were useful in determining herbicide efficacy. (Buchanan-Davidson--Wisconsin)
W76-06218

MORE WATER FOR ARIZONA.
Arizona Water Resources Committee, Phoenix; and Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 3B.
W76-06261

ORBITAL AND HIGH ALTITUDE IMAGERY AS A MANAGEMENT TOOL FOR LAND USE AND FLOOD HAZARD STUDIES,
Arizona Univ., Tucson. Office of Arid Land Studies.
R. B. Clark, and D. A. Mouat.
Arizona Water Resources Project Information, Project Bulletin No. 12, December, 1975. 4 p.

Descriptors: *Remote sensing, *Arizona, *Land development, *Flood plain zoning, *Mapping, Land use, Land management, Urbanization, Watersheds(Basins), Flood protection, Environmental effects, Aerial photography, Satellites(Artificial), Terrain analysis.
Identifiers: Apache county(Ariz), Yavapai county(Ariz), Yuma county(Ariz).

In response to the needs of planning within Arizona, the Applied Remote Sensing Program has developed cooperative projects with several user agencies to provide information concerning such problems as flooding and erosion hazards, status of land use, and environmental impacts of proposed or existing modifications of land. Remote sensing techniques provide a rapid and current inventory of subdivisions, as well as a means for monitoring the status of development. Land use inventory projects are currently being undertaken for Apache, Yavapai, and Yuma coun-

ties in Arizona which will use the output in the land regulation process. Areas subject to flooding in Arizona have been interpreted using ERTS-1 multispectral scanner imagery and color infrared photography from the high-altitude aircraft support. These products, in combination with ground checks on sample watersheds, have generated sufficient data for several counties to come into initial compliance with state and federal legislation mandating land use controls within flood-prone areas. Land use data developed can become a base from which county officials can direct the growth of the area in such a way as to maximize the benefit derived from existing social services and utilities while avoiding potentially dangerous flood hazard areas. (Robinett-Arizona)
W76-06262

SECONDARY SUCCESSION FOLLOWING EXTENDED INUNDATION OF TEXAS COASTAL RANGELAND,
Texas A and M Univ., College Station. Dept. of Range Science.
C. J. Scifres, and J. L. Mutz.
Journal of Range Management, Vol. 28, No. 4, p 279-282, July, 1975. 3 fig, 1 tab, 3 ref.

Descriptors: *Succession, *Environmental effects, *Range grasses, *Coasts, *Floods, Ecosystems, Grasslands, Plant populations, Ranges, Texas, Rain water, Coastal bermudagrass, Grasses, Range management, Mesquite, Vegetation establishment, Vegetation, Plant growth, Burning.
Identifiers: Acacia, Setaria, Longtom(Paspalum lividum), Cynodon dactylon(L.) Pers., Sprangletops(Leptochloa spp.), Trichloris, Eragrostis, Spike dropseed(Sporobolus contractus Hitchc.).

Large areas of Texas coastal rangeland may be inundated for several years by periodic tropical storms. Prior to flooding, the land usually supports acacias-mesquite (Acacia-Prosopis) communities with herbaceous vegetation dominated by several species of Setaria. After extended inundation with fresh water, secondary succession proceeds from a sedge-sodgrass stage through a sodgrass-bunchgrass stage to a bunchgrass stage. As the water withdraws, Longtom (Paspalum lividum Torr.) initially stabilizes the area, followed by common bermudagrass, (Cynodon dactylon (L.) Pers.) as the surface dries. Sprangletops (Leptochloa spp.) are among the earliest desirable species to appear during succession, followed by species of Trichloris and Eragrostis. Spike dropseed (Sporobolus contractus Hitchc) forms a stable vegetation stage in many cases, and although highly productive, periodic burning is required for effective utilization. (Robinett-Arizona)
W76-06267

DATA COLLECTION SYSTEMS AND THEIR IMPACT ON THE FUTURE DEVELOPMENT OF HYDROLOGY,
Department of the Environment, Reading (England). Water Data Unit.
For primary bibliographic entry see Field 7A.
W76-06277

FLOOD PLAIN INFORMATION: NORTH FORK ST. LUCIE RIVER, ST. LUCIE COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
Prepared for The Board of County Commissioners of St. Lucie County, November 1972. 26 p, 8 fig, 12 plates, 4 tab.

Descriptors: *Floods, *Flood forecasting, *Flood profiles, *Flood plains, Flooding, Flood flow, Hurricanes, Tidal waters, Tides, Historic floods, Flood data, Flood frequency, Peak discharge, Flood peak, Flow duration, Flood damage, Obstructions to flow, Canals, Warning systems, Control structures, *Florida.
Identifiers: Ten-Mile Creek(FA), Five-Mile Creek(FA), *St. Lucie River(FA), Intermediate Regional Flood, Standard Project Flood, Tidal flooding.

Properties in the study area flood plain are primarily agricultural and residential and have been developing because of an influx of retired people. Five-Mile Creek and Ten-Mile Creek with drainage areas of 10 and 80 sq. mi. respectively are tributary to the North Fork of the St. Lucie River with a drainage area of 590 square miles. The 1970 county population was 50, 836 and is expected to increase to 115,000 by the year 2000. Major floods occur in months June through October which coincides with the hurricane season. Seven floods have caused significant damage. A 1959 flood had a peak discharge of 4000 cubic feet per second. In an Intermediate Regional Flood a peak discharge of 2,300 cfs at the mouth of Five-Mile Creek, 9,800 cfs at the mouth of Ten-Mile Creek and 42,000 cfs on the North Fork of the St. Lucie River are predicted. This would produce a flood elevation of 15.4 feet above mean sea level which compares to the 7.6 feet msl elevation of the 1959 flood. Thirteen thousand acres of land would be flooded, 25% of which would be residential and 25% agricultural. Water velocities of 1 to 2 feet per second in the channel in the upper reaches and 1 to 3 ft/sec in the lower reaches are anticipated. During a Standard Project Flood a peak discharge of 2,900 cfs at the mouth of Five-Mile Creek, 12,200 cfs at the mouth of Ten-Mile Creek and 52,800 cfs on the North Fork of St. Lucie Creek are predicted. This would produce a flood elevation of 16.4 feet msl on the North Fork of St. Lucie River at White City Bridge. There are no regulatory measures in effect. (Smith - North Carolina)
W76-06282

FLOOD PLAIN INFORMATION: UVAS-CARNADERO CREEK, PAJARO RIVER TO UVAS RESERVOIR, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Santa Clara County, May 1973. 20 p, 12 fig, 14 plates, 5 tab.

Descriptors: *Flood plains, Floods, *Flood profiles, *Flood stages, *Flood forecasting, Bank erosion, Warning systems, Channel improvement, Reservoirs, Peak discharge, Flow duration, Flood data, Historic floods, *California, *Flash floods.
Identifiers: Uvas-Carnadero Creek(Ca), Santa Clara County(Ca), Gilroy(Ca), Pajaro River(Ca), San Jose(Ca), Santa Cruz Mtns.(Ca).

The Uvas-Carnadero system (drainage area 90 sq mi) is approximately 26 miles long with its headwaters in the Santa Cruz Mountains, in southern Santa Clara County. It flows generally southeast to join the Pajaro River about six miles south of Gilroy. Continued area growth is expected to cause Gilroy to expand to the south and west into the primarily agricultural flood plain of Uvas-Carnadero Creek. Bridges and vegetation can be expected to obstruct flood flows. Flood damage reduction measures have been limited to channel maintenance and construction of levees by local interests. Uvas Dam, completed in 1957 by the Santa Clara Valley Water Conservation District, can serve to regulate flood flows. No storage capacity is set aside for flood control purposes, thus limiting its effectiveness. Santa Clara County Flood Control and Water District has organized an Emergency Operations Center for monitoring flood situations. Flooding can occur from November to April, normally a rapid rate of rise occurs and the flood will stay out of the bank for less than one day. The worst flood of record in December 1955 forced the evacuation of 225 persons, inundated and damaged farm land, and eroded channel banks. Peak discharge reached 14,000 cubic feet per second at the mouth of the Carnadero Creek. The Intermediate Regional Flood and the Standard Project Flood will have peak discharges of 18,900 and 21,000 cfs respectively. Channel velocities will be 4-15 ft/sec during IRF. Overbank velocities will generally be less than 4 ft/sec. Flooding in Gilroy is expected to be 6 inches to 1 ft in the area south of Sixth Street. (Henley - North Carolina)
W76-06283

FLOOD PLAIN INFORMATION: STILL AND MAD RIVERS, TOWN OF WINCHESTER, CONNECTICUT.
Corps of Engineers, Waltham, Mass. New England Div.
Prepared for the Town of Winchester, Connecticut, May 1972. 31 p, 9 fig, 7 plates, 7 tab.

Descriptors: Floods, *Flood plains, Dams, *Flood profiles, Snowmelt, *Flood forecasting, Runoff, Hurricanes, Storms, Historic floods, Peak discharge, Flood peak, Flow characteristics, Flood damage, Warning systems, Flooding, *Erosion, *Connecticut.
Identifiers: *Mad River(CN), *Still River(CN), Winchester(CN), Winsted(CN), Litchfield County(CN), Indian Meadow Brook(CN), Mill Brook(CN), Rugg Brook(CN), Berkley Pond Brook(CN), Intermediate Regional Flood, Standard Project Flood, Farmington River Basin.

Mad River (drainage area 33.3 sq. mi.) flows into the Still River (drainage area 84.4 sq. mi.) in the southeastern part of the city of Winsted which is within the town of Winchester in Litchfield County. The Mad River, characterized by rapid flow and high flood flows, is fed by Indian Meadow Brook, Mill Brook, Rugg Brook, and Berkley Pond Brook, sources of high runoff during heavy rainfall or rapid snowmelt. Flooding can occur in any season and has historically resulted from hurricanes, general rainstorms, and snowmelt. The flood of August 1955 incurred heavy urban and industrial losses in the area (damage $21 million) and resulted in seven deaths. Peak discharges on the Mad and Still Rivers reached 15,100 and 36,300 cubic feet per second, respectively. The Intermediate Regional Flood would have peak discharge of 4,500 and 18,000 cfs on the Mad and Still Rivers respectively. The Standard Project Flood would have peak discharge of 8,000 and 22,150 cfs on the Mad and Still Rivers respectively. The IRF would result in residential, industrial, and limited commercial losses. Channel velocities would range from 5-25 ft/sec on the Mad River. Many of the 17 bridges that cross the two rivers would obstruct flow during an IRF and a SPF with erosion of channel and side bank areas. Since the disastrous flood of 1955 the Corps of Engineers has completed two projects, the Mad River Dam and Sucker Brook Dam which help control flood flows. Consequences of future flooding, however, could be increasingly costly as expected development in the flood plain occurs. (Henley - North Carolina)
W76-06284

FLOOD PLAIN INFORMATION: COASTAL AREAS, SARASOTA COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
Prepared for the Board of County Commissioners of Sarasota County, May 1973. 28 p, 7 fig, 16 plats, 3 tab..

Descriptors: *Floods, *Flood profiles, *Tidal waters, *Flood plains, Flooding, Hurricanes, Tides estuaries, Historic floods, Flood peak, Flood waves, Erosion, Non-structural alternatives, Flood plain zoning, Warning systems, Gulf of Mexico, *Florida.
Identifiers: Sarasota(FA), Venice(FA), Tidal flooding, Intermediate Regional Hurricane, Standard Project Hurricane, Keys.

The coastal study area is about 35 miles long and 1 to 3 miles wide with tidal flood plain extensively developed with residences, including multi-story apartments, commercial establishments and recreation facilities. The entire county had a popu-

lation of 120,413 in 1970 and is expected to increase to 215,000 by the year 2000. The county is composed of low-lying keys with almost continuous development separated from the mainland by bays and inlets. Inflow through the inlets and overtopping of the keys in severe storms can cause flooding. Both fresh-water floods due to intense rain and tidal floods caused by hurricanes and tropical storms occur. The latter storms are likely to occur in months June through November and primarily in September and October. The largest storm in the area caused a tide of 7 feet above mean sea level (msl). Total loss was estimated at $200,000. An Intermediate Regional Hurricane is predicted to have a central pressure of 27.45 inches of mercury, a radius of maximum winds equal to 14 nautical miles, winds of 110 mi/hour, and a forward speed of 11 knots. The tidal flood would reach an elevation of 12 feet msl along the open coast and interior coastal bays. This level would decrease about 1 foot per mile moving inland. About 17,000 acres would flood, including 10,000 developed acres and 12,000 structures. The Standard Project Hurricane would have a central pressure of 27.04 inches, a 16 nautical mile maximum radius, winds of 116 mph, and a forward speed of 18 knots. This would produce a tidal peak of 14.5 feet msl. About 28,000 acres would flood, 11,800 developed acres and 12,500 structures. City and County ordinances for zoning exist. (Smith - North Carolina)
W76-06285

DISTRIBUTION FUNCTIONS LIMITED AT THE ORIGIN (IM URSPRUNG BEGRENZTE VERTEILUNGSFUNKTIONEN),
For primary bibliographic entry see Field 2A.
W76-06316

CONTROLLING POLLUTION FROM COMBINED SEWERS,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W76-06328

FLOOD PLAIN INFORMATION: COASTAL AREAS, ST. LUCIE COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
Prepared for the Board of County Commissioners of St. Lucie County, July 1972. 24 p, 10 fig, 12 plates, 3 tab.

Descriptors: Floods, *Flood forecasting, *Flood profiles, *Hurricanes, *Tidal waves, *Erosion, Flood plains, Flooding, Shores, Flood data, Historic floods, Flood waves, Warning systems, Bulkheads, Waves(Water), Beaches, *Florida.
Identifiers: *Indian River(FA), Fort Pierce(FA), St. Lucie County(FA), Standard Project Hurricane, Tidal flooding, Intermediate Regional Hurricane, Jack Island(FA), Hutchinson Island(FA), Overtopping, Wave runup.

Properties in the portion of St. Lucie County covered here are primarily devoted to commercial fishing, the shipping industry, and other commerce. On Hutchinson Island, immediately south of Ft. Pierce Inlet, new residential development has started. If recreation demands increase as expected, development could increase rapidly. Jack and Hutchinson Islands average about 3 feet above mean sea level. An area 21 miles long and 2 to 3 miles wide separated from the rest of the county by a high ridge is described. Major floods are caused by abnormally high tides associated with a hurricane or tropical storm, generally in June through October. Flooding due to hurricane tides is generally less than 12 hours, reaching a peak in about 6 hours. A 1928 hurricane had winds over 100 mph in West Palm Beach (FA) and caused the loss of 2000 lives and considerable property damage. Relief efforts cost $25 million. The 1949 hurricane had winds of up to 120 mph in West Palm Beach and caused 2 deaths and $45 million in damage. In an Intermediate Regional Hurricane tidal elevations 7.3 feet above msl is possible along the open coast and 5 feet msl in the Indian River. Runup could reach 13 feet msl. Maximum wind speeds could reach 88 mph. In a Standard Project Hurricane an elevation of 9.6 feet msl is possible in open water and 7 feet msl in the Indian River. Runup could be 12 to 15 feet msl depending on the slope. Winds are estimated at 111 mph. Hurricane tides generally rise at 1 to 2 ft/hour, peak after 6 hours, and remain above normal less than 12 hours. Water velocities higher than 3 ft/sec are likely with higher velocities in open areas under the effect of hurricanes. Extensive erosion and structural damage to buildings are anticipated. (Smith-North Carolina)
W76-06354

FLOOD PLAIN INFORMATION: VAN DUZEN RIVER, HUMBOLT COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Humboldt County (CA), July 1973. 20 p, 9 fig, 13 plates, 6 tab.

Descriptors: *Floods, *Flooding, *Flood profiles, *Historic floods, *Flood plains, Streamflow forecasting, Flood data, Flood Frequency, Peak discharge, Obstruction to flow, Non-structural alternatives, Flood plain zoning, Levee, *California.
Identifiers: *Van Duzen River(CA), Humboldt Co(CA), Alton(CA), Yager Creek(CA), Bridgeville(CA), Hydesville(CA), Carlotta(CA), Eel River(CA), Intermediate Regional Flood, Standard Project Flood.

Land in this study area is used as rances and farms in the canyon through which the Van Duzen and its tributaries run, though most of the development occurs in the floodplain at the mouth of the Van Duzen in the communities of Alton, Hydesvile and Carlotta. The drainage area of the Van Duzen is 417 square miles downstream from Yager Creek. The river flows through steep, narrow-sided canyons at an average slope of 11 feet per mile. Normal annual precipitation is from 40 to 70 inches, and about 40% of the rain occurs in December and January. Six gaging stations operate on the Van Duzen River and records from these indicate the largest flood occurred in 1964 when the peak discharge was 48,700 cubic feet per second. At this time the Yager Creek had a peak discharge of 30,000 cfs. This flood caused damage estimated at $4,000,000 and one bridge was destroyed. In the event of an Intermediate Regional Flood a peak discharge of 94,000 cfs at the mouth of the Van Duzen River along with water velocities of 6 to 10 ft/sec in the channel in the upper reaches and 3 to 6 ft/sec in the lower reaches is predicted. The flood plain is classed as rural and 3000 acres are subject to flooding. The flood would rise 9 feet in about 40 hours and floodstage would last 71 hours. In a Standard Project Flood a peak discharge of 117,000 cfs is predicted and water velocities slightly higher than the Intermediate Regional Flood. The flood would rise 10 feet in 40 hours and floodstage would last 76 hours. None of the 3 bridges on the Van Duzen would be obstructive to either flood unless there is debris accumulation. (Smith-North Carolina)
W76-06355

FLOOD PLAIN INFORMATION: SAN TIMOTEO CREEK, VICINITY OF LOMA LINDA, SAN BERNARDINO COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
Prepared for San Bernardino County Flood Control District, June 1973. 55 p, 49 fig, 22 plates, 5 tab.

Descriptors: Flood flow, *Flood profiles, *Flood damage, *Flood plains, *Flood data, *Flood forecasting, *Erosion, Deposition, Storms, Flood frequency, Flood stages, Peak discharge, Flow duration, Flood peak, Floodways, Channels, Warning systems, Zoning, Channel improvement, *California.
Identifiers: San Bernardino County(Ca), San Timoteo Creek(Ca), Loma Linda(Ca), Riverside County(Ca), Santa Ana River(Ca), Wilson Creek(Ca), Redlands(Ca), Colton(Ca), San Bernardino(Ca), Bryn Mawr(Ca), Noble Creek(Ca), San Gorgonia Creek(Ca), Intermediate Regional Flood, Standard Project Flood.

The study area is the 6.5 mile reach of San Timoteo Creek from about 1 mile downstream from the San Bernardino-Riverside County boundary, to its confluence with the Santa Ana River, draining an area of 126 sq mi in southwestern San Bernardino County. This area includes Noble and Little San Gorgonia Creeks, the City of Loma Linda (population 10,000), parts of the cities of Redlands, Colton and San Bernardino, and the community of Bryn Mawr. Development in the flood plain consists of commercial (truck-stops, railroad sidings, storage yards), residential (light to medium density) and agricultural (citrus groves) uses. Continued development is expected. Flooding has historically occurred (13 large floods in the past 100 years) as the result of general summer storms, local summer storms and general winter storms. In January and February 1969 floods in San Bernardino County left 13 dead with $54 million damage. Damages in the San Timoteo study area (estimated at $6 million) were increased by the incidence of severe erosion, mudslides and the deposition of sediments (2-3 feet in portions of Loma Linda). The February flood, designated as a 50 year flood, is compared with the Intermediate Regional Flood and the Standard Project Flood, which would have peak discharges of 24,000 and 46,000 cubic feet per second respectively at the San Bernardino-Riverside County line. During IRF, channel and overbank velocities would reach 12-20 and 4-8 ft/sec respectively. Deposition and erosion will occur at bridges and embankments. Flood control efforts by San Bernardino County include channel improvements and flood plain zoning regulations (not yet covering the study area). (Henley-North Carolina)
W76-06356

FLOOD PLAIN INFORMATION: UPPER ST. VRAIN CREEK, VOLUME IV, BOULDER COUNTY, COLORADO.
Army Engineer District, Omaha, Nebr.
Prepared for City of Longmont and Boulder County, September, 1972. 24 p, 13 fig, 10 plates, 8 tab.

Descriptors: *Floods, *Flood flow, *Flood plains, *Flood stages, *Snowmelt, *Flood profiles, Runoff, Historic floods, Flood data, Flood frequency, Peak discharge, Flood peak, Flow duration, Flow characteristics, Floodways, Flood damage, Channels, Planning, Dams, *Colorado.
Identifiers: St. Vrain Creek(Co), Boulder County(Co), Lyons(Co), North St. Vrain Creek(Co), South St. Vrain Creek(Co), Rocky Mountains(Co), Intermediate Regional Flood, Standard Project Flood, Longmont(Co).

The study reach extends upstream from the confluence of two streams at Lyons (drainage area at Lyons 219 sq. mi.), 3.7 miles along the North St. Vrain Creek, and 1.5 miles along the South St. Vrain Creek, and downstream from the confluence point along St. Vrain Creek for 5.2 miles. St. Vrain Creek slopes between 42-48 ft/mi. The channel bed has cobbles and small boulders. Development in the flood plain includes residential and commercial uses. Pressure for more flood plain development is expected as Lyons (population 958) continues to grow due to the lack of suitably sloped land in the area plus the attraction of living near the stream. Eleven bridges, raised road surfaces and residential development can obstruct flood flows. Flooding (9 floods in the last 108 years) has occurred from May through September as the result of snowmelt runoff combined with rainfall. Peak flood is usually reached within several hours of the rainfall event. Flood duration is normally short but can be prolonged by continued rapid snowmelt. The Intermediate Re-

gional Flood and the Standard Project Flood will have peak discharges of 10,700 and 28,300 cubic feet per second respectively. In addition to scattered residences along the flood plains the IRF can be expected to flood large portions of the town of Lyons. Overbank flow velocities should be expected to be hazardous in Lyons and upstream. Downstream from Lyons, special care must be taken in road and building construction since modifications of the flood plain can alter flood patterns and inundate lands not now affected by flooding. (Henley-North Carolina)
W76-06357

FLOOD PLAIN INFORMATION: SALMON BROOK, EAST BRANCH AND WEST BRANCH, GRANBY AND E. GRANBY, CONNECTICUT.
Corps of Engineers, Waltham, Mass. New England Div.
January 1974. 26 p, 19 fig, 20 plates, 6 tab.

Descriptors: *Flood plains, *Channels, *Flood flows, *Flood peak, *Flood profiles, *Flood forecasting, Runoff, Storms, Hurricanes, Bank erosion, Flood data, Historic floods, Flow duration, Flow characteristics, Warning systems, Snowmelt, *Connecticut.
Identifiers: Salmon Brook(CN), East Branch Salmon Brook(CN), West Branch Salmon Brook(CN), Granby(CN), East Granby(CN), Farmington River(CN), Standard Project Flood, Intermediate Regional Flood, Hartford(CN).

Portions of the towns of Granby and East Granby, Connecticut, are subject to flooding from this 16.5 mile reach of Salmon Brook and its West and East Branches (drainage area 67.3 sq. mi.). Located in north central CN, these streams are tributaries of Farmington River. The flood plains of Salmon Brook, ranging up to 1,500 ft. in width, contain residential, commercial and farm development in the Granby area. Vegetation, 12 bridges, and narrow channel widths can restrict floodflows. Flood flows can occur in any season from general rainstorms which can be augmented by snowmelt and storms from tropical hurricanes that travel up the Atlantic seaboard. Major floods are most likely to occur in the spring, characterized by duration of from 12-36 hours. Backwater effects at the confluence of the East and West Branches as well as at Salmon Brook's confluence with Farmington River can increase flood heights during flood conditions. Flooding in August, 1955 did $3,500,000 damage in Granby and East Granby to residential, industrial, commercial and agricultural development. Peak discharge reached 40,000 cubic feet per second on Salmon Brook during this flood and can be expected to reach 29,700 cfs and 39,600 cfs during the Intermediate Regional Flood and Standard Project Flood respectively with mean channel velocities of 2-5 ft/sec. Velocities under the Penn-Central Railroad bridge are estimated for the IRF and SPF to be 15 and 17 ft/sec respectively, causing extreme erosion. (Henley-North Carolina)
W76-06358

FLOOD PLAIN INFORMATION: CYPRESS CREEK, ORANGE COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
Prepared for the Board of County Commissioners of Orange County, November 1971. 16 p, 1 fig, 6 plates, 1 tab.

Descriptors: *Floods, *Flooding, *Flood forecasting, *Flood profiles, *Flood plains, Lakes, Bulkheads, Runoff, Hurricanes, Historic floods, Peak discharge, Erosion, *Florida.
Identifiers: Cypress Creek(FA), Standard Project Flood, Intermediate Regional Flood, Windermere(FA), Tropical floods.

Population in this sub-tropical area of Florida is now 1000 but rapid growth is expected because of the tremendous expansion of Orlando 8 miles away. Considerable development is anticipated on the flood plain which has residences, streets, utilities and citrus groves unless adequate land use policies are adopted. Cypress Creek drains a total of 31 sq mi and flows through a basin 12 miles long and varying from 1 to 4 miles in width. The basin has a central chain of lakes which first fill to capacity in heavy rains and then overflow into the Cypress Swamp which is drained by two 5-foot culverts. In the past minor damage has been caused to low roads and some residences. Information on flooding, available from newspaper accounts and limited gaging records, indicates that most major floods occur during the passage of hurricanes and tropical storms through or near the study area in late summer or early fall. Annual precipitation averages about 52 inches with 75% of rain falling in June through October. In an Intermediate Regional Flood a peak elevation of 102.3 ft in the northern part of the basin and 101.2 ft in the southern part can be expected. A total of 1950 acres could be flooded. Waves as high as 2 ft could be generated if windspeeds from a tropical storm reach 40 mph. Rates of flood rise should be low and several days advance warning should be possible. Peak stage should last several days and waters could be above normal high stage for a month or more. In a Standard Project Flood maximum elevations of 103.2 ft in the northern part of the basin and 101.5 ft in the southern part can be expected. There are no existing or planned Federal flood control projects, but some individuals have built bulkheads along the shores of some of the lakes which prevent some erosion. (Smith-North Carolina)
W76-06359

THE BLACK HILLS (SOUTH DAKOTA) FLOOD OF JUNE 1972: IMPACTS AND IMPLICATIONS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2E.
W76-06360

RECOVERY FROM SOIL COMPACTION ON BLUEGRASS RANGE IN THE BLACK HILLS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-06362

TREND SURFACE ANALYSIS OF POWDER RIVER BASIN, WYOMING - MONTANA,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
In: Proc. Fort Union Coal Field Symp., Vol 3: Reclamation section. p. 280-288. (Montana Acad. Sci., Billings, April 1975), 5 fig, 9 ref.

Descriptors: *Land reclamation, *Terrain analysis, *Regression analysis, *Landscaping, *Aesthetics, Landshaping, Slopes, Land use, Geomorphology, Wyoming, Montana.
Identifiers: Premining inventory of landscape, Quantitative geomorphology, *Powder River Basin(Wyo-Mont).

Trend (regression) surface analysis provides a convenient means of understanding spatially variable information. Thus topographic parameters graphically displayed as isopleths are used to evaluate quantitatively the topography of the coal strip mining areas of Wyoming and Montana. The analysis is expected to provide insight into basic questions of surface reclamation including the following: (1) how closely should topography be returned to the way it was before mining. (2) what landscape design needed so that the mine spoil areas can aesthetically blend into the undisturbed landscape. (3) what changes in surface and subsurface hydrology can be anticipated between disturbed and undisturbed lands. (Forest Service)
W76-06363

COAL MINE SPOIL AS A GROWING MEDIUM: AMAX BELLE AYR SOUTH MINE, GILLETTE, WYOMING,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 5G.
W76-06364

FLOOD OF JUNE 1971 FORT NELSON AND MUSKWA RIVERS,
Department of the Environment, Vancouver (British Columbia). Inland Waters Directorate (Pacific Region); and Department of the Environment, Vancouver (British Columbia). Water Resources Branch.
For primary bibliographic entry see Field 2E.
W76-06367

SURFACE WATER DATA, REFERENCE INDEX, CANADA 1975.
Canada Centre for Inland Waters, Burlington (Ontario); and Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W76-06377

A COMBINED MODEL OF WATER TABLE AND RIVER STAGE EVOLUTION,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 2A.
W76-06380

RECOVERY FROM SOIL COMPACTION ON BLUEGRASS LANGE IN THE BLACK HILLS,
Forest Service (USDA), Rapid City, S. D. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W76-06405

ADVANCES IN HYDROSCIENCE, VOLUME 10-1975.
For primary bibliographic entry see Field 8B.
W76-06412

THEORY OF WEIRS,
Indian Inst., of Science, Bangalore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-06416

PUBLIC INVOLVEMENT IN THE CORPS OF ENGINEERS PLANNING PROCESS,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-06417

DETERMINATION OF OPTIMUM QUANTITY OF SERVICE WATER OBTAINABLE FROM ONE DAM SYSTEM,
Kyushu Inst. of Tech., Kitakyushu (Japan).
S. Murakami.
Journal of Hydrology (Amsterdam), Vol. 28, No. 2/4, p 229-244, February 1976. 6 fig, 6 tab, 10 equ, 3 ref.

Descriptors: *Dams, *Markov processes, *Probability, Monthly, Constraints, Water supply, Reservoirs, Least squares method, Optimization, Reservoir releases, Systems analysis, Mathematical models, Equations.
Identifiers: *Operating rule, Heuristic programming, *Japan, Emptiness.

The monthly operating rule of a one-dam system is considered. The monthly inputs into the reservoir are approximated by Gamma-type distributions and output is constant in a period of a month. The mathematical model of the discrete dam system is

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treated as a Markov chain model. The problem is how to determine the optimum quantity in each month so as to maximize the yearly obtainable water from a dam, under the constraint that the probability of reservoir emptiness is less than 0.1. To solve this problem, heuristic programming is used. The numerical results of the optimum quantity in each month under the above constraint are shown by using the input data of real reservoirs in Japan. This method may also be applied to the problem of how to allocate the monthly release from a multi-reservoir system so as to satisfy the demand of water of a city. (Bell-Cornell)
W76-06419

EVALUATION OF SHORT-TERM OPERATIONAL POLICIES FOR A MULTI-PURPOSE RESERVOIR SYSTEM,
Water Resources Board, Reading(England).
D. G. Jamieson, D. K. Smith, and J. C. Wilkinson.
Journal of Hydrology, Vol. 28, No. 2/4, p 191-213, February 1976. 4 fig, 2 tab, 8 ref.

Descriptors: *Multiple-purpose reservoirs, *Water policy, *Evaluation, *Short-term planning, Water supply, Management, Flood control, Reservoir operation, Simulation analysis, Constraints, Mathematical models, Systems analysis.
Identifiers: *Operating rules, United Kingdom.

As water supply demands on existing river-regulation schemes increase, it may be possible to defer large capital expenditure by operating the existing system more efficiently, since wastage due to indifferent management can account for up to 22 percent of the total reservoir storage capacity. While not all floods can be contained by component reservoir management, many can be mitigated by careful operation of the reservoir sluices. Considered is the short-term control strategy for the management of multi-purpose reservoirs for water supply and flood alleviation in the River Dee system. As a first step towards implementation, the existing operating rules have been compared objectively to the proposed control policy, and this is reported concerning the short-term strategy. The objective of the present control policy is to contain the high flows of the catchment's headwaters in the reservoirs while the peak flows of the down stream portion of catchment pass down the main channel. Considering the proposed operation procedure, a comprehensive telemetry scheme is being installed on the Dee catchment; the optimal control of the reservoir sluices depends on the ability to forecast future flow sequences. A hydrologic simulation package (DISPRIN) acts of the telemetered rainfall data and upstream tributary flows to produce forecast hydrographs which are routed through reservoirs, if appropriate, and down the main river channel. Whereas the existing control rules attempt a compromise between flooding to critical areas, the proposed strategy gives preference to the area around Llyn Tegid. (Bell-Cornell)
W76-06420

RELEASE CONTROL POLICY FOR A LARGE LAKE SUBJECT TO WIND WAVES,
Water Resources Center, Budapest (Hungary).
I. Bogardi, L. Duckstein, and W. A. Metler.
Journal of Hydrology (Amsterdam), Vol. 28, No. 2/4, p 175-190, February 1976. 3 fig, 3 tab, 3 equ, 7 ref.

Descriptors: *Lakes, *Control, *Water policy, *Water levels, *Dynamic programming, *Stochastic processes, Reservoir releases, Methodology, Monthly, Water storage, Shores, Damages, Hydrologic aspects, Economics, Optimization, Inflow, Equations, Algorithms, Mathematical models, Systems analysis, *Risks.
Identifiers: Lake Balaton(Hungary), Computational procedures.

Presented is a methodology for controlling the level of a large and shallow lake subject to a double uncertainty in the state of nature. The two uncertainty components are: (1) average monthly static water level, which determines benefits and losses associated with tourism and storage of water; and (2) monthly maximum dynamic water level, which may cause extensive shore damage. The computational procedure for finding the optimum control policy utilizes stochastic dynamic programming. The methodology is demonstrated by means of the case study of Lake Balaton in Hungary where data on the water level rise caused by wind are available. The model for dependent monthly inflows has been computerized and implemented on the CDC 6400 at the University of Arizona. (Bell-Cornell)
W76-06421

CONTROL OF A RIVER SYSTEM WITH TWO STORAGE RESERVOIRS,
Birmingham Univ. (England). Dept. of Civil Engineering.
M. J. Hamlin, N. T. Kottegoda, and T. Kitson.
Journal of Hydrology (Amsterdam), Vol. 28, No. 2/4, p 155-173, February 1976. 4 fig, 1 tab, 10 ref.

Descriptors: *Water storage, *River systems, *Reservoirs, *Control, River regulation, Water policy, Water yield, Operations research, Hydrologic aspects, Simulation analysis, Low flow, Computer models, Reservoir releases, Constraints, Equations, Mathematical models.
Identifiers: *Severn River(England), Vyrnwy reservoir(England), Predictive models, Regulation losses, Bivariate model, Synthetic data.

Described is a system in which a number of controls are used for operational purposes. Some of these controls have been determined purely empirically as in the case of flood alleviation. The controls which protect the firm withdrawal requirements for water supply purposes from Vyrnwy reservoir are determined statistically and the control of reservoir releases for river regulation purposes are based on a crude predictive model. The investigation was undertaken to determine whether rescheduling of statutory releases from the Vyrnwy reservoir could be effectively used to improve regulation of the River Severn and thus increase the quantity of water which could be abstracted without additional capital expenditure. Regulation losses can be substantial when there is a travel time of five days, as in this case, between the reservoir and the river control point. The possibility of reducing this loss by constructing bankside storage low down in the catchment is also considered. (Bell-Cornell)
W76-06422

CONTROL OF ABSTRACTION BY LAW,
For primary bibliographic entry see Field 6E.
W76-06423

VIABILITY OF EXISTING WATER RESOURCE MODELS, THE POTOMAC RIVER BASIN WATER SUPPLY ALTERNATIVES,
Interstate Commission on the Potomac River Basin, Bethesda, Md.
For primary bibliographic entry see Field 6A.
W76-06424

APPLICATION OF MULTI-REGIONAL PLANNING MODELS TO THE SCHEDULING OF LARGE-SCALE WATER RESOURCE SYSTEMS DEVELOPMENT,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6A.
W76-06425

CASE STUDY: FOR THE ANALYSIS OF WATER MANAGEMENT INVESTMENTS ON HAND OF THE EXAMPLE OF THE KISKORE RIVER BARRAGE AND ITS IRRIGATION SYSTEMS,
G. Reich.
Working Paper No. 54, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975 (Paper in French). 2 fig, 3 tab, 6 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *Water management(Applied), *Investment, *Irrigation systems, *Economic efficiency, Social aspects, Effects, Projects, Costs, Arid lands, Europe.
Identifiers: *Tisza River Valley(Hungary), *Kiskore River Barrage(Hungary), Arid regions.

The Tisza Valley in Hungary is plagued by an increasingly serious water shortage. The canalization of the Tisza River is important in solving the problem of increasing demands for water. The most important link in the canalization is the Kiskore River Barrage and the complex system of projects connected with it. The purpose and the technical capacity figures of the system of projects and the characteristic features of their implementation are described. Included is a formulation of the perspective socio-economic effect of the system (investments and expected economic benefits) and an attempt to quantify its economic efficiency. Economic efficiency is evaluated in two different ways. This is carried out partly from an economic point of view--using prices of 1972--and partly by forming dynamic indices projected onto the year 1973, the financial main point of the investments continued and benefits carried into effect in a long period. Beside efficiency (profit return) indices, the specific costs of the projects and of the benefits produced are given as auxiliary indices. It can be stated as a final conclusion that both expected perspective socio-economic effects and the efficiency of the system of projects will form in accordance with those planned. (Bell-Cornell)
W76-06427

COOPERATIVE MANAGEMENT AND DEVELOPMENT OF INTERNATIONAL RIVER BASINS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
L. B. Dworsky.
Working Paper No. 50, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 2 charts, 18 ref, 22 p.

Descriptors: *River basin development, *Management, International commissions, Water policy, Hydrologic aspects, Economics, Decision making, Organizations, Behavior, International law, Planning.
Identifiers: *International cooperation.

This general report has three objectives, all of which follow the guidelines provided by the Seminar organizers. First, it presents some specific factors influencing cooperation among cobasin countries and discusses problems and issues affecting international water management organizations. Second, it views a number of background reports and conference papers in the light of these factors and identifies illustrative types of resource situations from these and other sources. Third, it proposes a number of questions for consideration by the Seminar and its work groups with the expectation that the results of discussions will provide substantive material for the 1977 United Nations Water Conference. Considered are factors influencing cooperation, hydrologic-economic incentives, international relations, policy-making and implementation, general problems and issues, organizational behavior, decision-making analysis, areas of international conflict, commission structure, and reviews concerning international activities, with case studies and resource situations. (Bell-Cornell)
W76-06428

RIVER BASIN DEVELOPMENT FOR SOCIO-ECONOMIC GROWTH,
National Water Authority, Budapest (Hungary). Dept. of Water Management Policy.
L. David.
Working Paper No. 52, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 2 fig, 7 equ, 19 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *River basin development, *Comprehensive planning, *Optimum development plans, *Water resources, Social aspects, Economics, Growth, Constraints, Equations, Optimization, Water demand, Water supply, Runoff, Systems analysis, Mathematical models.
Identifiers: Interdisciplinary planning.

This general report analyzes the inseparable connection between socio-economic growth (SEG) and river basin development (RBD), considering RBD as a subsystem of SEG. The concept of comprehensive river basin development is discussed, its systems analysis is presented, and main conditions and means of the reasonable implementation of RBD are determined. A set of conclusions and proposals for further action is listed. The purpose of RBD is to achieve the optimum use of natural water resources on basin-wide scale during socio-economic development. The criteria of optimum use depend at all times on the constraints of SEG. RBD is a comprehensive, man-made process involving social, economic, technical, environmental, and natural elements, discussed herein in detail. The RBD process has three basic evolution periods and needs to be planned and controlled using systems analysis. The evaluation of alternative development policies and strategies can be attained using optimization techniques and mathematical models. A comprehensive, interdisciplinary approach is of growing importance, covering simultaneously the technical, economic, social, legal and administrative aspects, including problems of uncertainties. The proposals listed cover, among others, the process analysis of RBD and the development of long-range river basin planning methods, techniques and data collection. (Bell-Cornell)
W76-06429

WATER QUALITY CONTROL SYSTEM OF ZAGYVA RIVER BASIN,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5G.
W76-06430

LONG-TERM OPERATION OF STORAGE HYDRO PROJECTS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
W. F. Caselton, and S. O. Russell.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Proceedings Paper NO. 12089, Vol. 102, No. WR1, p 163-176, April 1976. 5 fig, 1 tab, 9 ref.

Descriptors: *Water resources, *Probability, *Reservoir storage, *Hydroelectric power, *Powerplants, Methodology, Optimization, Energy, Computers, Operations research, Projects, Long-term planning, Mathematical models, Equations, Systems analysis.
Identifiers: *Systems engineering, Decomposition approach.

The introduction of large storage hydroelectric projects into an existing mixed hydro and thermal generating system increases the need for sound long-term operating policies and system development plans. The complexity of the integrated overall operation of such a generating system is too great for direct application of optimization techniques. This paper describes a methodology which performs a detailed optimization of the long-term operation of a part of the generating system, comprising a large storage hydro project and a thermal plant, under varying conditions of thermal capacity and firm energy demand. When the methodology was applied to an actual large storage hydro project the results provided considerable insight into the long-term integrated operating characteristics of hydro and thermal plants. A basis for coordinating long-term operation with the large storage hydroprojects is suggested. The methodology involves decomposing the system into separate hydrothermal subsytememes and analyzing each with a special algorithm. The method finds the best way to integrate the operation of a mixed hydrothermal electric power generation system where one or more of the reservoirs are large enough to provide overyear storage. (Bell-Cornell)
W76-06434

FLOOD DAMAGE REDUCTION POTENTIAL OF RIVER FORECAST,
Wisconsin Univ., Green Bay. Coll. of Environmental Science.
For primary bibliographic entry see Field 6F.
W76-06435

A PRACTICAL MONTHLY OPTIMUM OPERATIONS MODEL,
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office; and Bureau of Reclamation, Sacramento, Calif. Water and Power Control Div.
D. M. Fults, L. F. Hancock, and G. R. Logan.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Proceedings paper No. 12063, Vol. 102, No. WR1, p 63-76, April 1976. 7 fig, 1 tab, 4 ref.

Descriptors: *Water resources, *Forecasting, *Mathematical models, *Computer programs, Engineering, Systems analysis, Dynamic programming, Multiple-purpose projects, Operations research, Projects, Equations, Algorithms, Reservoirs, Water policy, *Optimization, Constraints, Flood control, *California.
Identifiers: Operating policy, *Central Valley Project(Calif).

A mathematical model is developed for the Central Valley Project in California. The model produces a 12-month operating policy; it is programmed in FORTRAN IV for processing on a CDC CYBER 74 computer. Project operations managers are using the model as a decision-advising tool. This model will be coupled with a daily strategy mode. A four-dimensional dynamic programming algorithm is developed to optimize the operation of the four-reservoir system. The objective of the model is to maximize energy generation within the limits of firm water and power contracts, mandatory releases, and flood control. A unique technique given the acronym RecIP for recomputed initial policy is developed to compute the initial operating policy that is optimized. The RecIP technique is an iterative process using the results of the incremental dynamic programming algorithm to compute a new initial policy to satisfy the required end of operational period target storages desired by the user. (Bell-Cornell)
W76-06436

DIVERSION OF WATER THROUGH NORTHFIELD MT. PUMPED STORAGE PROJECT,
Stone and Webster Engineering Corp., Boston, Mass. Water Resources Group.
C. W. Lockwood.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR1, Proceedings paper No. 12075, p 49-62, April 1976. 9 fig, 1 tab, 2 ref.

Descriptors: *Water resources, *Water supply, *Pumped storage, *Inter-basin transfers, Diversion, Inlets(Waterways), Pumping, Reservoirs, Water quality, Projects, *Connecticut River.
Identifiers: Northfield Mt. pumped storage project(Mass).

Provisions were made at the Northfield Mountain Pumped Storage Project for the diversion of 26 billion gallons or 79,800 acre-ft of water per year from the Connecticut River to the Quabbin Reservoir. The outlet works including gates, fish screens, stop logs, metering devices, and transmitting and recording devices were provided by Northeast Utilities. During periods of flood flow in the Connecticut River, excess flow will be pumped into reserve space in the upper reservoir by use of the main pump-turbine units and this will then be permitted to run through the diversion works which include the outlet works and the proposed aqueduct to the Quabbin Reservoir. Northeast Utilities is cooperating with the Commonwealth of Massachusetts in the proposed development of this source of water supply. This diversion project utilizing a pumped storage hydroelectric power project to augment a municipal water supply is unique and important. (Bell-Cornell)
W76-06437

FLOOD-PRONE AREAS OF GADSDEN COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-06443

WATER RESOURCES OF THE THRUST BELT OF WESTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 7C.
W76-06448

PHYSICAL AND CLIMATIC CHARACTERISTICS ALONG KANSAS STREAMS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W76-06450

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1975,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 7C.
W76-06451

GEOLOGIC AND WATER-SUPPLY REPORTS AND MAPS--WYOMING, JULY 1975,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 10C.
W76-06456

EROSION AND SEDIMENT TRANSPORT IN THE OWENS RIVER NEAR BISHOP, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W76-06458

INFLATABLE WATER-RETAINING BARRIER,
Pneumatiques, Caoutchouc Manufacture et Plastiques Kleber-Colombes (France), (Assignee).
For primary bibliographic entry see Field 8A.
W76-06462

WATER RESOURCES DEVELOPMENT OF INTERNATIONAL RIVERS WITH SPECIAL REFERENCE TO THE DEVELOPING WORLD,
West Indies Univ., Barbados. School of Law.
P. K. Menon.
International Lawyer, Vol. 9, No. 3, p 441-64 (1975). 24 p.

Descriptors: *Coordination, *Water resources development, *Rivers, *International law, *Conservation, Planning, Agriculture, River basins, Data collections, Construction, Maintenance, Consumptive use, International waters, Irrigation, Riparian rights, Flood control, Navigation, Prior appropriation, Dams, Industries, Electric power.
Identifiers: *International cooperation.

The rational utilization and optimum development of international water resources require cooperative and concerted action by riparian states on the basis of legal principles defining rights and obligations. International water law, which is not well developed at this time, can be divided into four categories: territorial integrity, absolute sovereignty, community in the waters, and limited territorial sovereignty. In the developed nations, controversies regarding the utilization and control of international rivers have been settled through agreements between the nations involved. In the developing nations, the trend of legal arrangements is taking on different features, including: (1) integrated basin development with multi-purpose projects and basin-wide programs; (2) joint and coordinated action; (3) community interests; (4) limitation of sovereignty; and (5) respect for national sovereignty. The administrative question that arises in undertaking the construction of projects is whether construction should be done by a joint agency or divided between the countries. A similar problem arises with respect to operation and maintenance of the projects. Where a joint agency is established for construction, it may be necessary to have special agreements concerning the proper laws to be applied. (Segall-Florida)
W76-06486

FLOOD PLAIN AND TSUNAMI INUNDATION AREA ORDINANCE.
For primary bibliographic entry see Field 6F.
W76-06492

SAMPLE SUBDIVISION CONTROL ORDINANCE FOR FLOOD HAZARD AREAS.
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 6F.
W76-06494

REORIENTATION OF URBAN WATER RESOURCES RESEARCH, FINAL REPORT,
Rutger-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W76-06553

REORIENTATION OF URBAN WATER RESOURCES RESEARCH, EXECUTIVE SUMMARY,
Rutger-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W76-06554

EVALUATION OF POLLUTION ABATEMENT TECHNIQUES APPLICABLE TO LOST CREEK AND BROWN'S CREEK WATERSHED, WEST VIRGINIA.
Ackenheil and Associates Geo Systems, Inc., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W76-06570

DEVELOPMENT OF A PRIORITY DETERMINATION PROCEDURE.
Rivkin/Carson, Inc., Washington, D.C.; and Edwards (Arthur) Associates, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06571

A PROPOSAL FOR FUTURE UTILIZATION OF THARTHAR LAKE WATER,
Institute for Applied Research on Natural Resource, Baghdad (Iraq).
For primary bibliographic entry see Field 3C.
W76-06577

DRAINAGE AND RECLAMATION PERFORMANCE AT THE IMAM EXPERIMENTAL FIELD IN THE GREATER MUSSAYEB PROJECT, A MONITORING STUDY,
Institute for Applied Research on Natural Resources, Baghdad(Iraq).
For primary bibliographic entry see Field 3C.
W76-06581

DYNAMICS OF MARSH LAND FORMATION AND SUCCESSION ALONG THE LOWER COLORADO RIVER AND THEIR IMPORTANCE AND MANAGEMENT PROBLEMS AS RELATED TO WILDLIFE IN THE ARID SOUTHWEST,
Arizona State Univ., Tempe.
R. D. Ohmart, W. O. Deason, and S. J. Freeland.
In: Transactions of the 40th North American Wildlife and Natural Resources Conference, 1975, Published by the Wildlife Management Institute, Washington, D.C., p. 240-251 (1975). 9 fig, 1 tab.

Descriptors: *Colorado River, *Wildlife, *Habitat improvement, *Freshwater marshes, *Succession, Ecology, Wildlife conservation, Wildlife management, *Marsh management, Riparian plants, Aquatic habitats, Southwest U.S., Arid lands, Saline water, Environmental effects, Marshes.
Identifiers: *Topock Marsh, Beaver Lake, Lake Su-ta-nah, Duck Lake, Hunters Hole, Powell Slough, Lake Tapio, Blankenship Bend, Lake Havasu, Three Fingers Lake.

Historical evidence indicates that backwater marsh situations were never very extensive or enduring (50 to 70 years) along the lower Colorado River (delta excluded). These backwaters have been and remain important habitats for many forms of wildlife, but may become useless to some wildlife in a few years because of salinization and anoxia. Increased access to the river due to road development and increased river navigability has allowed people to invade the river and its backwaters, disrupting wildlife feeding and nesting activities. Conditions have been eased somewhat by the creation of three Federal refuges on the river (Imperial, Cibola, and Havasu), but damaging human impact is still widespread. Enhancement of backwater habitats for wildlife must be a consideration in future construction projects along the river. Following construction, access roads should be completely closed to public use to at least one-quarter mile and preferably one-half mile from the marshes. Future backwaters intended for wildlife should be constructed to contain gently sloping shorelines to support emergent vegetation, yet have deepwater areas to prevent high water temperatures in summer months. Some type of water exchange with the river is required to provide fresh and cool water inflow. Backwaters must be managed to prevent silt and organic accumulation which eventually reduces the general wildlife use value. Precision dredging or draglining appears to be the best method currently available. (Robinett-Arizona)
W76-06589

SOIL EROSION AND SEDIMENTATION IN TANZANIA AND LESOTHO,
Secretariat for International Ecology, (Sweden).
For primary bibliographic entry see Field 4D.
W76-06593

BLACK RIVER BAROMETER WATERSHED IN RELATION TO THE RESOURCE MANAGER,
Forest Service (USDA), Springerville, Ariz. Apache-Sitgreaves National Forest.
For primary bibliographic entry see Field 4D.
W76-06599

HYDROLOGICAL FORECASTING PRACTICES.
World Meteorological Organization, Geneva (Switzerland). Working Group on Hydrological Forecasting.
For primary bibliographic entry see Field 2A.
W76-06633

STATE-OF-THE-ART SURVEY AND EVALUATION OF MARSH PLANT ESTABLISHMENT TECHNIQUES: INDUCED AND NATURAL; VOLUME I: REPORT OF RESEARCH,
Michigan Univ. Ann Arbor, School of Natural Resources.
J. A. Kadlec, and W. A. Wentz.
Available from the National Technical Information Service, Springfield, Va. 22161, AD-A012 834, $9.00 in paper copy, $2.25 in microfiche. Contract Report D-74-9, December 1974. 266 p, 5 fig, 8 tab, 419 ref, 4 append. Army DACW72-74-C-0010.

Descriptors: *Aquatic plants, *Marsh plants, *Marshes, Vegetation, Aquatic environment, *Marsh management, Reproduction, *Vegetation establishment, Freshwater, Saline water, Salinity, Temperature, Soils, Wetlands, Environment, *Reviews, *Bibliographies.

Knowledge of marsh and aquatic plant establishment was assessed by reviewing the literature and contacting agencies and individuals likely to have relevant information. Factors that affect plant establishment in saltwater areas include tides salinity, drainage, aeration, water table, rainfall, soil, evaporation, temperature, biota, water depth, light penetration, and current and wave action. In freshwater areas, water levels or depths, substrate, water quality, turbidity, currents and wave action are particularly important. Aquatic and marsh plants propagate naturally by both seeds and vegetative parts. The propagules are dispersed by wind, water, animals, and man. By controlling various environmental factors, it is possible to promote and encourage the natural invasion and growth of aquatic and marsh plants, especially in freshwater systems. In many cases, plantings of aquatic and marsh plants will be necessary to vegetate a new substrate. Seeding appears to be the least expensive procedure, but environmental condition must be favorable or success will be low. Transplants usually provide faster establishment and are hardier than seedlings. Efforts at establishing Spartina alterniflora in Atlantic coast marshes have shown good results. The basic problems encountered in the establishment of aquatic and marsh plants are physically unsuitable substrates, nutrient deficiencies, polluted sediments, excessive wind or current action, excessive turbidity, unfavorable patterns of water level fluctuations, and unfavorable water depths. Research is needed in aquatic and marsh plant taxonomy, biology, and ecology. Special effort should be devoted to the study of site conditions and propagule collecting and planting methods. (See also W76-06636) (Sims-ISWS)
W76-06635

STATE-OF-THE-ART SURVEY AND EVALUATION OF MARSH PLANT ESTABLISHMENT TECHNIQUES: INDUCED AND NATURAL; VOLUME II: A SELECTED ANNOTATED BIBLIOGRAPHY ON AQUATIC AND MARSH PLANTS AND THEIR MANAGEMENT,
Michigan Univ., Ann Arbor, School of Natural Resources.
W. A. Wentz, R. L. Smith, and J. A. Kadlec.
Available from the National Technical Information Service, Springfield, Va. 22161, as Ad-Ao-12837, $7.75 in paper copy, $2.25 in microfiche. Contract Report D-74-9, December 1974. 206 p, append. Army DACW72-74-C-0010.

Descriptors: *Aquatic plants, *Marsh plants, *Bibliographies, Abstracts, Information retrieval, Publications, Marshes, Vegetation, Marsh management, Wetlands, Environment, *Reviews.

The 703 references listed in this volume were collected for the investigation of marsh and aquatic plant establishment which is reported in Volume I, Report of Research, of this report. The purpose of this bibliography is to make available an annotated listing of references which were not cited in Volume I. Although the bibliography does not represent an exhaustive review of the literature, it does provide an extensive survey of the pertinent references on the ecology and management of aquatic and marsh plants. The references selected for this bibliography emphasize studies useful to researchers and managers and concentrates on coastal, Great Lakes, and riverine marshes. (See also W76-06635) (Sims - ISWS)
W76-06636

SEASONAL STREAMFLOW ESTIMATION EMPLOYING SATELLITE SNOWCOVER OBSERVATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
A. Rango, V. V. Salomonson, and J. L. Foster.
Available from the National Technical Information Service, Springfield, Va. 22161 as N75-18695 $5.00 in paper copy, $2.25 in microfiche. Preprint X-913-75-26, February 1975. 34 p, 8 fig, 2 tab, 9 ref.

Descriptors: *Remote sensing, *Snow cover, *Streamflow forecasting, *Runoff, Snowmelt, Snowpacks, Melt water, Satellites(Artificial), Water supply, Snow surveys, Runoff forecasting, Data processing, Analytical techniques.
Identifiers: *LANDSAT.

Low resolution meteorological satellite and high resolution earth resources satellite data have been used to map snowcovered area over the upper Indus River and the Wind River Mountains of Wyoming, respectively. For the Indus River early Spring snowcovered area was extracted and related to April through June streamflow from 1967-1971 using a regression equation (coefficient of determination = 0.91). Prediction of the April-June 1972 streamflow from the satellite data was within 3% of the actual total. Composited results from two years of data over seven Wind River Mountain watersheds indicated that LANDSAT-1 snowcover observations, separated on the basis of watershed elevation, could also be related to runoff in significant regression equations. It appears that earth resources satellite data will be useful in assisting in the prediction of seasonal streamflow for various water resources applications, nonhazardous collection of snow data from restricted-access areas, and in hydrologic modeling of snowmelt runoff. (Sims - ISWS)
W76-06638

LAKE MANAGEMENT CONFERENCE, MAY 12-14, 1975.
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 941, $7.75 in paper copy, $2.25 in microfiche. Proceedings of Conference sponsored by the Purdue University Water Resources Research Center. 206 p. (1975). D. Wiersma ed. OWRT A-999-IND(4).

Descriptors: *Lake Morphology, *Lake Fisheries, *Aquatic Weed control, *Herbicides, *Wetlands, *Fish management, Lakes, Lake basins, Limnology, Eutrophication, Recreation facilities, Indiana.
Identifiers: *Lake renovation, Biologic weed control.

This is the proceedings of a two-day conference sponsored by the Purdue University Water Resources Research Center. The program was developed for a lay audience interested in the maintenance and restoration of the natural lakes of Northeastern Indiana. It began with a discussion of the origin and general characteristics of Indiana lakes followed by presentations related to the role of government and local institutions as regulating agents. The second day dealt with some of the biological, physical and chemical means for restoring and maintaining lake quality. A panel discussion was held on the controversial issue of the phosphate ban in detergents. Panel members presented short papers after which there was a lively participation by the audience. (Wiersma-Purdue)
W76-06642

THE INFLUENCE OF FLOOD HAZARDS UPON RESIDENTIAL PROPERTY VALUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6F.
W76-06643

A SOCIO-ECONOMIC EVALUATION OF ALTERNATIVE WATER MANAGEMENT POLICIES ON THE RIO GRANDE IN NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
For primary bibliographic entry see Field 6B.
W76-06644

USE OF RADAR INFORMATION IN DETERMINING FLASH FLOOD POTENTIAL,
National Weather Service, Garden City, N.Y. Eastern Region.
E. Wasserman.
NOAA TM NWS ER-60, December 1975. 10 p, 3 tab, 4 ref.

Descriptors: *Meteorology, Hydrology, *Precipitation(Atmospheric), *Flash floods, *Flood forecasting, Flood control, Warning systems, Rainfall intensity, Weather data, *Radar, Weather forecasting.
Identifiers: *Flash-flood potential, Flash flood guidance, MDR observations.

A systematic method is described in which manual digital radar values are used with flash flood guidance to help isolate areas where there is a flash flood potential. Radar estimates of maximum precipitation are compared objectively with the minimum, three-hour precipitation amounts required for flash flooding. Through this comparison, areas that have a potential for flash flooding are determined. Flash Flood Guidance is the minimum rainfall required for flash flooding. Using the three latest manually digitized radar (MDR) observations, a three-step procedure is presented for monitoring flash flood potential. A fourth step which requires detailed radar information, such as remote radar facsimile data, also is described. (NOAA)
W76-06653

LAKE HURON BEGINNING-OF-MONTH WATER LEVELS AND MONTHLY RATES OF CHANGE OF STORAGE,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2H.
W76-06657

BUFFALO HARBOR DIKED DISPOSAL SITES: ENGINEERING PROPERTIES AND DRAINAGE CHARACTERISTICS,
State Univ. of New York Coll. at Buffalo.
For primary bibliographic entry see Field 5E.
W76-06666

METHOD FOR REDUCING SINGLE DISCHARGE MEASUREMENTS TO THE AVERAGE DISCHARGE OF THE LOW-FLOW PERIOD,
For primary bibliographic entry see Field 2E.
W76-06679

CONTROLLING RESERVOIR TRAP EFFICIENCY,
Agricultural Research Service, Columbia, Mo. North Central Watershed Center.
For primary bibliographic entry see Field 8B.
W76-06682

THE IMPACT OF OVERWINTER DRAWDOWN ON THE AQUATIC VEGETATION OF THE CHIPPEWA FLOWAGE, WISCONSIN,
Wisconsin Univ., Madison. Environmental Resources Extension.
S. A. Nichols.
Wisconsin Academy of Sciences, Arts and Letters, Vol. 63, p. 176-186, 1975. 1 fig., 5 tab., 12 ref.

Descriptors: *Aquatic weed control, *Plant populations, *Drawdown, Water level fluctuations, Reservoirs, Winter, Wisconsin.
Identifiers: Chippewa Flowage(Wis.).

The stabilization of aquatic plant species in response to 50 years of water level fluctuations in the Wisconsin Chippewa Flowage (a 6120 ha area of interconnected bays, lake basins, and flood river channels operated as a storage, flood control, and recreation reservoir) is indicated. The variety of plant species is now much greater and there is no significant decrease in diversity with increased drawdown and in fact some of the highest diversity occurs in areas that had the greatest amount of drawdown. Although the water levels, fluctuate dractically, most fluctuations do not occur during the growing season. Exposure of reproductive parts is not always detrimental and may even be beneficial or necessary for germination of certain species. Clyceria borealis, Leersia orozoides, Polygonum natans, Salix interior, Scripus validus and Sium suave all showed an increase under drawdown conditions, as these species can survive under both terrestrial and aquatic situations. Asclepias incarnata, Brasenia schreberi, Elocharis acicularis, Nuphar variegatum, Numphaea tuberosa, Potamogeton ampliflolius, Potentilla palustris, and Sagittaria latifloria showed a preference for stabilized water levels. Najas flexilis, Potamogeton americanus, P. foliosus, P. gramineus and Anacharis canadensis appear to be able to recover and actually can increase after repeated drawdowns. (Auen-Wisconsin).
W76-06711

IDENTIFICATION AND MANAGEMENT OF EURASIAN WATER MILFOIL IN WISCONSIN,
Wisconsin Univ. Extension, Madison. Environmental Resources Unit.
For primary bibliographic entry see Field 5C.
W76-06725

WATER ECONOMY OF A SOIL ON WEATHERED GRANITE UNDER A SPRUCE GROVE, (IN FRENCH),
Paris-7 Univ. (France). Lab. of Biogeography.
For primary bibliographic entry see Field 2G.
W76-06728

FLOODING AS THE RESULT OF HURRICANE AGNES, AND ITS EFFECT ON A MACROBENTHIC COMMUNITY IN AN INFERTILE HEADWATER STREAM IN CENTRAL PENNSYLVANIA,
Pennsylvania Fish Commission, Bellefonte. Benner Spring Fisheries Research Station.
For primary bibliographic entry see Field 5C.
W76-06748

ECOLOGICAL EFFECTS OF WEATHER MODIFICATION: EFFECT OF LATE SNOW-MELT ON FESTUCA IDAHOENSIS ELMER MEADOWS,
Montana State Univ., Bozeman. Dept. of Biology.
For primary bibliographic entry see Field 3B.
W76-06756

THE EFFECT OF FOREST ON MINIMUM RIVER RUNOFF IN THE BROAD-LEAVED FOREST ZONE AND FOREST-STEPPE OF THE EUROPEAN PART OF THE USSR, (IN RUSSIAN),
For primary bibliographic entry see Field 4C.
W76-06783

OPTIMAL DISTRIBUTION OF ASSIMILATES DURING LIMITED WATER SUPPLY: A MATHEMATICAL MODE, (IN RUSSIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Institut Fiziki i Astronomii.
For primary bibliographic entry see Field 2I.
W76-06786

EFFECTS OF ANTITRANSPIRANTS ON DISTRIBUTION AND UTILIZATION OF PHOTOSYNTHATE IN PINUS RESINOSA SEEDLINGS,
Ibadan Univ. (Nigeria). Dept. of Botany.
For primary bibliographic entry see Field 2I.
W76-06792

4B. Groundwater Management

KANSAS GROUNDWATER POLICY SEMINAR,
Kansas Water Resources Research Inst., Manhattan.
L. F. Keller.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 545 , $4.50 in paper copy, $2.25 in microfiche. KWRRI Contribution No. 171, October 1975. 62p 2 fig, 4 append. OWRT A-064-Kan(1) 14-31-0001-5016.

Descriptors: *Groundwater mining, *Kansas, Decision making, Water policy, Future planning(Projected), Groundeater resources, Water supply, Water management(Applied), Conferences, Research priorities, Water utilization.
Identifiers: Applied research, Policymakers, Groundwater seminar, Future groundwater policies.

The project was a seminar designed on groundwater mining in Kansas. Policy makers and experts on water resources, both from within and outside the University, acted as research resources, project critics and reality checks for student research. Both policymakers and experts made presentations to particular sessions of the seminar and indicated future research topics on groundwater. Three topics are required: (1) the siminar and how well it worked; (2) Kansas groundwater policies and (3) future policy issues in groundwater mining.
W76-06154

SALINITIES OF AMBIENT AND INTERSTITIAL WATERS OF SOME MASSACHUSETTS NORTH SHORE SALT-MARSHES,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5B.
W76-06158

THE ROLE OF GROUNDWATER IN RURAL SUPPLIES IN GHANA,
Ghana Water and Sewerage Corp., Bolgatanga.
R. R. Bannerman.
Hydrological Sciences Bulletin, Vol. 20, No. 2, p 191-201, June 1975. 4 fig, 2 tab, 9 ref.

Descriptors: *Groundwater, *Rural areas, *Africa, Population, Water supply, Hydrogeology, Water policy, Rocks, Boreholes, Unit costs, Dug wells, Pumps.
Identifiers: *Ghana, *Rural water supplies, Rural communities, *West Africa, Villages, Hand-pumps, Hand-pump operations.

Over 60% of the population of Ghana is described as rural and is projected to remain so up to the end of the century. Water supplies for these populations are generally unsafe and unreliable. Waterborne diseases are endemic. Concern has been expressed in government planning and development programs; and planners were required to study the groundwater potential of the country and to what use groundwater should be put to in a rural water supply program. Results of studies conducted showed that water supply schemes based on groundwater sources have a clear economic advantage over those based on surface water. Relatively shallow boreholes equipped with dependable hand-pumps have a cost advantage over deep boreholes with motorized pumps. With the rather limited funds allocated for meeting rural water supply needs economically, a hand-pumped borehole program has been recently initiated and is already making a great impact among the rural people. (Roberts - ISWS)
W76-06169

HOT SPRINGS OF RHODESIA: THEIR NOBLE GASES, ISOTOPIC AND CHEMICAL COMPOSITION,
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
For primary bibliographic entry see Field 2K.
W76-06190

PUBLIC GROUNDWATER SUPPLIES IN PUTNAM COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller, and E. W. Sanderson.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-251 550 $3.50 in paper copy, $2.25 in microfiche. ISWS Bulletin 60-18, 1976. 13 p, 2 fig, 1 tab.

Descriptors: *Water supply, *Illinois, *Groundwater resources, Well data, Unconsolidated aquifers, Gravels, Sand aquifers, Bedrock, Sandstones, Dolomite, Groundwater availability, Groundwater, Hydrology, Hydrogeology, Water sources, Water quality, Water wells, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Deep wells, Shallow wells, Geology, Aquifers.
Identifiers: *Putnam County(Ill), Dissolved minerals, Water bearing formations.

All available information was presented on production wells used for public groundwater supplies in Putnam County, Illinois. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. Unconsolidated sand and gravel deposits associated with the Illinois River valley and the ancient Mississippi valley are tapped as a source of public water supply. There are 7 supply wells finished in these aquifers at depths of 100 to 237 ft. Reported yields range from 15 to 780 gpm. Analyses of water from these wells indicated that the iron content ranges from 0.0 to 7.6 mg/l, and the hardness from 296 to 379 mg/l. One well penetrates the Pennsylvanian rocks. It is 320 ft deep and is pumped at a rate of 15 gpm. A recent analysis of water from this well indicated the iron content is 0.42 mg/l and the hardness is 326 mg/l. The deep-lying Galena-Platteville Dolomite and Glenwood-St. Peter Sandstone are also tapped as a source of public water supply. Three wells in use range in depth from 1741.6 to 1793 ft. They are pumped at rates of about 60 to 150 gpm. Analyses of water from these wells show the iron content ranges from 0.1 to 3.8 mg/l, chlorides from 240 to 3690 mg/l, sodium from 245 to 2550 mg/l, hardness from 219 to 238 mg/l, and total dissolved minerals from 975 to 6333 mg/l. INdividual production wells for each supply were described in the order of their construction. The description for each well includes the aquifer or aquifers tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses. (Humphreys - ISWS)
W76-06237

CONVERSION OF DESALINATION PLANT BRINES TO SOLIDS,
Badger (W. L.) Associates, Inc., Ann Arbor, Mich.
For primary bibliographic entry see Field 3A.
W76-06248

PUBLIC GROUNDWATER SUPPLIES IN MACOUPIN COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-251 674 $3.50 in paper copy, $2.25 in microfiche. ISWS Bulletin 60-17, 1976. 9 p, 1 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, *Well data, Unconsolidated aquifers, Gravels, Sand aquifers, Groundwater, Groundwater availability, Hydrology, Hydrogeology, Water sources, Water quality, Water wells, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Shallow wells, Geology.
Identifiers: *Macoupin County(Ill), Dissolved minerals, Water bearing formations.

All available information was reported on production wells used for public groundwater supplies in Macoupin County, Illinois. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. Sand and gravel deposits in the unconsolidated materials above bedrock are tapped as the sources for three public water supplies. There are presently five public supply production wells, ranging in depth from 34 to 54 ft. Their reported yields range from 15 to 150 gpm. Past and present analyses of water from the three groundwater supplies indicated that the iron content ranges from 3.1 to 19 mg/l, and the hardness from 176 to 580 mg/l. Individual production wells for each supply were described in the order of their construction. A description for each well includes the aquifer tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses. (Humphreys-ISWS)
W76-06257

PLANNING A MUST FOR GROUNDWATER DEVELOPMENT,
Clinton Bogert Associates, Fort Lee, N.J.
J. J. Baffa.
Water and Wastes Engineering, Vol. 12, No. 2, p 44-50, Feb., 1975. 3 fig.

Descriptors: *Aquifers, Groundwater, *Groundwater recharge, *Groundwater potential, *Artificial recharge, *Natural recharge, Water resources, Injection wells, Boundaries, Water quality, Land use, Borehole geophysics, Maryland, Oklahoma, New York.
Identifiers: *Long Island(NY), *Riverhead(NY).

Careful analysis is needed in groundwater aquifer development. Quantity of groundwater available is related to aquifer extent and properties, recharge characteristics, natural discharge, artificial recharge possibilities, drought occurrence, and withdrawals already being made. Quality is related to the naturally occurring relationships of solubili

ty and ion exchange of soil rocks. Geophysical methods and bore holes can suggest location of aquifers. Resistivity methods can be used to locate groundwater boundaries such as faults and dykes. Induced recharge can be accomplished by creating a reservoir in a natural streambed located in a recharge area. Rates of .1 to .4 feet per day have been reported for this type of recharge depending on local conditions. Artificial recharge of special recharge basins or wells is from diversion of stream flow from peak discharge periods or of storm water. Recharge rates of 30 feet per day and occasionally as high as 100 feet per day have been recorded. Injection wells operate in the range of 50 to 3000 gallons per minute. In designing groundwater supply, account must be taken of the effects of urban and agricultural land use, sanitary landfills, dissolved solids present, biological activity and the possibility of purifying water before recharge. It is good practice to undertake pilot projects before undertaking large scale facilities; well performance, well levels, hydrodynamic dispersion of recharge waters, and water quality effects may be measured in order to estimate recharge potential. (Smith - North Carolina)
W76-06273

HYDROLOGICAL AND HYDROGEOLOGICAL ASSESSMENT OF LANDFILL SITES,
For primary bibliographic entry see Field 5E.
W76-06315

GROUND-WATER QUALITY IN SELECTED AREAS SERVICED BY SEPTIC TANKS, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-06442

THE LOWER WILCOX AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-06444

THE MIOCENE AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-06445

HYDROLOGIC DATA FOR THE IDAHO NATIONAL ENGINEERING LABORATORY SITE, IDAHO, 1971 TO 1973,
Geological Survey, Idaho Falls, Idaho.
For primary bibliographic entry see Field 5B.
W76-06447

WATER RESOURCES OF THE THRUST BELT OF WESTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 7C.
W76-06448

FACTORS ALTERING THE MICROCLIMATE IN CARLSBAD CAVERNS, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2D.
W76-06452

HYDROLOGIC EVALUATION OF SALINITY CONTROL AND RECLAMATION PROJECTS IN THE INDUS PLAIN, PAKISTAN--A SUMMARY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5G.
W76-06453

BIBLIOGRAPHY OF STUDIES ON THE DENSITY AND OTHER VOLUMETRIC PROPERTIES FOR MAJOR COMPONENTS IN GEOTHERMAL WATERS, 1928-1974,
Geological Survey, Menlo Park, Calif.
R. W. Potter, D. R. Shaw, and J. L. Haas, Jr.
Open-file report 75-147, 1975. 78 p.

Descriptors: *Geothermal studies, *Bibliographies, *Reviews, *Publications, *Thermal water, Properties, Chemical properties, Salts, Density, Natural resources, Energy, Information retrieval.

This bibliography is an annotated listing of 230 references pertaining to the density of solutions of importance to geothermal exploration and energy production. The scope of this report has been restricted to reference containing data on aqueous solutions of the following salts: HC1, NaC1, KC1, CaC12, FeC12, H2S04, NaHS04, Na2S04, KHS04, K2S04, FeS04, H2C03, NaHC03, Na2C03, KHC03, K2C03, NaOH, KOH, Si02(ag), 'sea water'. The bibliography is a first step toward satisfying the needs of scientists and engineers as were expressed at the Conference on Thermodynamics and National Energy Problems and as further amplified by an an hoc committee of scientists convened by the U.S. Atomic Energy Commission. Support for this work has come from the U. S. Geological Survey's geothermal research program. (Woodard-USGS9
W76-06454

AQUEOUS SOLUBILITY OF PETROLEUM AS APPLIED TO ITS ORIGIN AND PRIMARY MIGRATION,
Geological Survey, Denver, Colo. Office of Energy Resources.
L. C. Price.
American Association of Petroleum Geologists Bulletin, Vol 60, No 2, p 213-244, February 1976. 19 fig, 9 tab, 175 ref.

Descriptors: *Solubility, *Oil, *Aqueous solutions, *Groundwater, *Temperature, Depth, Aquifers, Thermal water, Chemical reactions, Salinity, Vertical migration, Oil industry, Organic compounds.
Identifiers: *Petroleum.

The aqueous solubilities of individual hydrocarbons, petroleums, and petroleum fractions increase with increasing temperatures as determined by solubility data gathered in this study. The rate of solubility increase is uniform from room temperature to about 100 deg C where it increases drastically. At temperatures in excess of 180 deg C petroleum solubilities in water are high enough to account for the formation of petroleum deposits by a molecular-solution primary-migration mechanism. For example, the aqueous solubility of the gas-oil fraction (boiling range 316-371 deg C of the Ghawar Arabian crude oil shows over a 400-fold increase from 25 deg C to 180 deg C from 0.042 ppm to 17.0 ppm. The pronounced decrease in solubility of petroleums at the lower temperatures at shallow lower basin depths and from the movement of fresh shale waters into salty sand waters both readily serve to release dissolved hydrocarbons during the upward movement of deep basinal waters. Other investigators have shown that 15-20 percent water, by volume, remains in the clastic sediments at depths below 4.27-5.49 km in the Gulf Coast and other basins. This quantity of water as shown by mass-balance calculations is sufficient to account for the primary migration of petroleum from source rocks by molecular solution. Faults are believed to provide the main pathway for the vertical movement of water and dissolved hydrocarbons from great basinal depths. (Woodard-USGS)
W76-06455

SOUTHEASTERN MICHIGAN WATER-RESOURCES STUDY: GROUND WATER AND GEOLOGY,
Geological Survey, Lansing, Mich.
F. R. Twenter.
Geological Survey Data report, 1975. 143 p, 31 fig, 36 tab, 46 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water quality, *Hydrogeology, *Michigan, Data collections, Water supply, Water demand, Water utilization, Water yield, River basins.
Identifiers: Southeastern Michigan.

Southeastern Michigan, an area of 5,407 sq mi, encompasses all or parts of 13 counties and is drained by 7 major streams. About half of the State's population reside in the area. The land surface ranges in altitude from about 570 ft to about 1,200 ft. Precipitation ranges from 28 to 34 in annually. The average stream discharge in the area is about 2,300 cfs. Both bedrock and glacial deposits yield water to wells in the study area. Aquifers of both rock types underlie parts of the area. Of the bedrock formations that are tapped, the Saginaw Formation, Marshall Formation, Berea Sandstone, Sylvania Sandstone, and Bass Islands Dolomite generally yield the greatest quantities of water--in some places as much as 300 gpm. In the glacial deposits, sand and gravel, often occurring as outwash, are the principal water-producing rocks. In some places as much as 3,000 gpm can be obtained from these rocks. In both bedrock and glacial deposits the concentration of dissolved solids increases as the well depth increases. Many deeper wells yield water that is too highly mineralized for most uses. (Woodard-USGS)
W76-06457

PROGRESS REPORT ON THE WATER RESOURCES INVESTIGATION OF MARTIN COUNTY, FLORIDA,
Geological Survey, Tallahasee, Fla.
J. E. Earle.
Open-file report FL 75-521, 1975. 20 p, 10 fig, 1 tab, 6 ref.

Descriptors: *Water resources, *Data collections, *Water quality, *Florida, Groundwater, Surface waters, Aquifer characteristics, Water level fluctuations, Withdrawal, Water supply, Municipal water, Observation wells, Salinity, Streams, Nitrogen, Phosphorus.
Identifiers: *Martin County(Fla).

The base of the shallow aquifer ranges from 125 feet below sea level in the northwest part of Martin County, Fla., to about 280 feet below sea level in the southeast part of the county. Water levels decline about 2 to 5 feet during the dry season (October 1973 to May 1974) in most areas of Martin County. Within the area influenced by the pumping of Stuart's public supply wells, water level declined 6 feet between October 1973 and May 1974. Water levels during January - May 1974 in this area were 3 to 6 feet lower than they were in January - May 1965. This difference was due to a three-fold increase in pumpage (0.8 to 2 mgd) from 1965 to 1974. Chloride concentrations in four salt water monitoring wells around the Stuart well field ranged from 35 to 45 mg/litre during the rainy season of 1973. No appreciative increase in chlorides was found by the end of the next dry season. Water from five surface water sites had higher concentrations of phosphorus than water found in a typical urban area in Fort Lauderdale. Water from seven sites contained concentrations of nitrogen less than the typical rural site average. (Woodard-USGS)
W76-06459

GROUND-WATER IN NEW MEXICO, 1973,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 7C.
W76-06460

SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE -GROUNDWATER USAGE - PHASE 2,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux, R. A. Young, and G. E. Radosevich.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 889, $8.00 in paper copy, $2.25 in microfiche. Environmental Resources Center, Colorado State University, Fort Collins, Completion Report Series No. 68, September 1975, 229 p. OWRT B-109-COLO(5) 14-31-0001-4067

Descriptors: Groundwater, *Surface-groundwater relationships, Regulation, Pumping, Optimization, Design, *Conjunctive use, Water law, Legal aspects, Water management(Applied), Aquifers, Computer programs, *Model studies, Water wells, Arid lands, Seepage.
Identifiers: *Groundwater management, Conjunctive operations.

The design of regulations for integrated management of surface and groundwater is a complex and crucial problem in regions of the United States with a dry climate and a paucity of water resources. Analysis of the problem indicated the need to develop a new approach to hydrologic modeling of the interactions between a stream and an alluvial aquifer. This new approach conveniently provides the aquifer response to pumping from wells, the aquifer response to seepage flow from the river and the river response to pumping from wells. Several computer programs, operating sequentially, have been developed. Tests of the programs reported here, show that the developed technique provides comparable accuracy to more standard approaches. The benefits of the new approach are realized when the hydrologic model is coupled with an economic objective and with legal constraints. Several computer programs were developed. One of these computer programs (the most important and complex one) is fully documented in this report. Illustrative applications of these programs to solution of management problems involving legal constraints and economic considerations are provided. (See also W74-04853).
W76-06551

GROUNDWATER RESOURCES OF ALTUN-KUPRI AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
R. H. Haddad, P. B. Smoor, D. Y. Bashoo, S. K. Sarbaro, and J. J. Dunnat.
Technical Bulletin 69, September, 1974. 115 p, 37 fig, 7 tab, 17 ref, 2 append.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Transmissivity, *Storage coefficient, *Safe yield, Aquifer systems, Groundwater, Hydrogeology, Water sources, Water supply, Natural recharge, Groundwater recharge, Water resources development, Alluvium.
Identifiers: *Altun-Kupri(Iraq).

The Altun-Kupri area located in northern Iraq covers about 860 square kilometers and has large potential groundwater resources which have only been partially developed. The upper part of the aquifer system, which is the main area of present and potential development, consists of Pleistocene and recent alluvial deposits underlain by Bakhtiari formation. Recharge generally takes place in the upland outcrop area of the Bakhtiari formation and the principal zone of discharge is in the vicinity of the mouth of the Jolak Wadi. Average transmissivity of the upper part of the aquifer system was estimated at about 2200 sq m/day, and because of the generally unconfined to semi-confined nature of the aquifer, a storage coefficient of 0.1 was assumed. Recharge to the entire basin for 1973-74, based on water level fluctuations and flow net analysis, was about 84,000,000 cubic meters per year. If pumping is confined to the upper part of the aquifer system, about 36 to 68 million cubic meters per year may be available for groundwater development from both temporary and permanent storage, assuming perfect completion and distribution of wells and certain critical limits for the drawdowns permitted. (Robinett-Arizona)
W76-06576

HIDDEN WATERS IN ARID LANDS.
Report of a Workshop on Groundwater Research Needs in Arid and Semi-Arid Zones, November 25, 1974, Paris, France, International Development Research Centre, Ottawa, Canada, 1975. 18 p. 2 append. L. A. Heindl, ed.

Descriptors: *Groundwater, *Arid lands, *Water resources development, *Water supply, *Droughts, Groundwater resources, Water quality, Semiarid climates, Water shortage, Environmental effects, Social aspects, Hydrogeology, Hydrologic data, Water management(Applied).

Because arid and semi-arid zones encompass about one-fifth of the earth's surface, increasing numbers of people continue to expand the use of these regions for food production and living space. The shortage of water can be eased in many regions by use of the huge reserves of groundwater stored in confined aquifers underlying these areas, but in many regions the amount and quality available are unknown. The Association of Geoscientists for International Development attempts in this workshop to single out specific research needs by presenting country reports, in an informal setting, that deal with the sources and quality of groundwater, the environmental and cultural impact of development, and coping with drought. Recommendations call for (1) exchange of information and encouragement of research, (2) immediate attention to an array of eight specific areas of applied research, (3) prompt attention to provision for trained hydrogeologists and hydrological engineers in critical areas, (4) managerial practices in the field of water development, (5) preparation of inventories of regional groundwater resources, and (6) collection of information on local droughts by hydrogeologists. (Robinett-Arizona)
W76-06585

COSTS ARE SOARING: IRRIGATING FROM THE UNDERGROUND,
Arizona Univ. Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-06586

FINITE STATE MIXING-CELL MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2F.
W76-06594

UNCERTAINTIES IN KARSTIC WATER RESOURCES SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2F.
W76-06595

A SOCIO-ECONOMIC EVALUATION OF ALTERNATIVE WATER MANAGEMENT POLICIES ON THE RIO GRANDE IN NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
For primary bibliographic entry see Field 6B.
W76-06644

WATER POLLUTION ABATEMENT THROUGH FOREST IRRIGATION WITH MUNICIPAL WASTE WATER,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W76-06668

WEATHERING AND HYDROGEOLOGY OF THE BRUMUNDDAL SANDSTONE, SOUTHERN NORWAY,
Norges Landbrukshoegskole, Vollebekk. Geologisk Institutt.
For primary bibliographic entry see Field 2F.
W76-06676

MONITORING GROUND-WATER QUALITY NEAR A SANITARY LANDFILL,
Earthview, Incorporated, Toledo, Ohio.
For primary bibliographic entry see Field 5A.
W76-06684

RAPID RECHARGE IN A LIMESTONE AQUIFER,
Birmingham Univ.,(England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-06685

FIBONACCI SEARCH FOR HIGH-YIELD WELL SITES,
California Univ., Davis. Dept. of Civil Engineering.
O. J. Helweg.
Ground Water, Vol. 14, No. 2, p78-81, March April 1976. 6 fig, 1 tab, 2 ref.

Descriptors: *Operations research, *Drilling *Test wells, *Optimization, Aquifers, Bedrock Mathematical studies, Statistical methods, Cos comparisons, Channels, Risks, Bounda ries(Surfaces), Exploration.
Identifiers: *Fibonacci search, *Minimizatio techniques, Buried bedrock valleys, Pascal's trian gle, Symmetry.

In areas where the bedrock is irregular, depres sions in the bedrock formation can yield signif cantly higher amounts of water because th aquifer has a greater saturated thickness. Findin these areas by drilling test holes is a common prac tice but one that can be conducted more econom cally if an efficient search procedure is utilize This paper described such a technique called th Fibonacci Search and showed that it can sav thousands of dollars in the cost of drilling te holes when compared to 'brute-force' method (Visocky-ISWS)
W76-06686

PUMPING TEST ANALYSIS WHEN PARAME TERS VARY WITH DEPTH,
Birmingham Univ., (England). Dept. of Civil E gineering.
K. R. Rushton, and Y. K. Chan.
Ground Water, Vol. 14, No. 2, p 82-87, Marc April 1976. 5 fig, 4 ref.

Descriptors: *Aquifer testing, *Data processin *Depth, *Numerical analysis, Computer model Permeability, Storage coefficient, Aquifer chara teristics, Test wells, Limestones, F sures(Geologic), Fracture permeability, Pumpin Drawdown, Observation wells.
Identifiers: *England, *Vertical flow componen *Discrete-space discrete-time techniqu Parabolas.

The analysis of pumping tests for the sa borehole but with different rest water levels m lead to significantly different values of aqui parameters. A numerical method of pumping-t analysis was introduced in which the permeabil

nd storage coefficient can take different values epending on the current saturated depth. By in-roducing varying values of permeability and torage coefficient, the numerical model was used o represent pumping tests in a soft limestone quifer. (Visocky-ISWS)
/76-06687

ITRATES IN KANSAS GROUNDWATERS AS ELATED TO ANIMAL AND HUMAN IEALTH,
Kansas State Univ., Manhattan. Comparative oxicology Lab.
or primary bibliographic entry see Field 5B.
/76-06754

C. Effects On Water Of Man's Non-Water Activities

REVENTION AND CONTROL OF CULVERT CING, SUMMARY REPORT ON STUDIES FY 966-70,
old Regions Research and Engineering Lab., anover, N. H. Experimental Engineering Div.
or primary bibliographic entry see Field 8A.
/76-06193

HE ROLE AND FUNCTION OF VERDURE IN ROTECTING THE HUMAN ENVIRONMENT.
olskie Towarzystwo Przyrodnikow im. Koper-ka, Warsaw.
. Wojcierowska.
'szechswiat. 4. 96-98. 1973.

escriptors: Industrialization, Urbanization, Environmental effects, *Vegetation effects, En-ronmental control, Pollutants, Pollution abate-ent, *Air pollution, *Soil contamination, *Water ollution.
entifiers: Verdure, Tree belts, Forest belts.

ne results of soil, water and air pollution from in-strialization and urbanization are listed. Protec-ve measures are suggested, and establishment of otective belts of verdure is recommended. Stu-es were carried out on the filtrating action of ant cover. The level of air pollution under crons trees declined by 20-40% during the period of ll vegetation, and by 13-18% during the period leaflessness as compared to treeless areas. Sug-stions are given on how tree belts should be anted in industindustrialized areas and in urban nters in order to be most effective asair filbters.-opyright 1975, Biological Abstracts, Inc.
76-06240

OAL MINE SPOIL AS A GROWING MEDIUM: MAX BELLE AYR SOUTH MINE, GILLETTE, YOMING,
orest Service (USDA), Fort Collins, Colo. Rocky ountain Forest and Range Experiment Station.
r primary bibliographic entry see Field 5G.
76-06364

IE EFFECT OF LAND USE ON THE CHEMI-L AND PHYSICAL QUALITY OF SURFACE ID GROUND WATERS IN SMALL WATER EDS,
assachusetts Univ., Amherst. Dept. of Plant and il Sciences.
r primary bibliographic entry see Field 5B.
76-06552

E GREEN BAY WATERSHED - ST/PRESENT/FUTURE,
sconsin Univ., Madison Inst. for Environmen-Studies.
r primary bibliographic entry see Field 5C.
6-06569

KANEOCHE ALTERNATIVES: AN APPLICATION OF IMPACT METHODOLOGY.
Hawaii Environmental Simulation Lab., Honolulu.
For primary bibliographic entry see Field 6G.
W76-06574

THE RATIONALE OF NOMAD ECONOMY,
Uppsala Univ. (Sweden).
C. G. Widstrand.
Ambio, Vol. 4, No. 4, p 146-153, 1975. 3 fig, 12 ref.

Descriptors: *Livestock, Carrying capacity, Environmental effects, *Grazing, *Droughts, *Economics, Water shortage, Disasters, Migration.
Identifiers: *Nomads, Desertification.

Livestock herding peoples in west and east Africa have been severely hit lately by drought conditions. Thedisaster situation has been used as a means to change the life of these peoples. The survival of such peoples depends on a precise manipulation of the ecology, rational decision making, and risk management. However factors outside their control (water development, veterinary services, the creation of new international boundaries) have contributed heavily to the overstocking problem. (Robinett-Arizona)
W76-06591

DESERTIFICATION: A WORLD PROBLEM,
Worldwatch Inst., Washington, D.C.
E. P. Eckholm.
Ambio, Vol. 4, No. 4, p 137-145, 1975. 3 fig, 20 ref.

Descriptors: *Deserts, Grazing, Ecology, *Environmental effects, *Arid lands, Crop production, *Droughts, *Boundary processes, Burning, Productivity, Population, Accelerated erosion, Frail lands, Soil-water-plant relationships.
Identifiers: *Desertification, Sahelian zone.

Overgrazing and overly intensive cropping encourage the spread of deserts in Africa, Asia, and Latin America, and undermine the productivity of vast semiarid zones throughout the world. The evidence of desert encroachment worldwide is surveyed, and the implications of recent climatic change theories are discussed. Directions for the ecologically sustainable exploitation of arid lands are outlined. (Robinett-Arizona)
W76-06592

MANAGING CHAPARRAL FOR WATER AND OTHER RESOURCES IN ARIZONA,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W76-06597

VEGETATION MANAGEMENT FOR WATER AND RANGE IMPROVEMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W76-06598

STABILIZATION OF CLAY SOILS AGAINST EROSION LOSS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W76-06640

URBAN EFFECTS ON THE DISTRIBUTION OF HEAVY CONVECTIVE RAINFALL,
Illinois State Water Survey, Urbana.
F. A. Huff.
Water Resources Research, Vol. 11, No. 6, p 889-896, December 1975. 5 fig, 6 tab, 9 ref. NSF GI-38317.

Descriptors: *Rainfall, *Convection, *Rainfall disposition, *Central U.S., *Urbanization, Industries, Rainfall intensity, Weather modification, Floods, Water yield, Hydrology, Meteorology, Hydrologic aspects, Flood control, Rain gages, Sewers, Rural areas, Storms, Frequency.
Identifiers: Raincells, *Urban areas, Rainstorms, St. Louis(Mo), Alton(Ill), Wood River(Ill), Duration, Metromex, Sewer design.

Data from a network of 225 recording rain gages in 5500 sq km in the St. Louis area, operated during the summers of 1971-1973, were used to investigate potential urban effects upon the distribution of heavy rainfalls. Emphasis was placed upon analysis of: (1) rain cells, the basic convective unit responsible for the production of heavy short-duration rates in thunderstorm-dominated climates; and (2) the distribution of heavy rainstorms producing 25 mm or more of rainfall within the network. Results showed a substantially greater water yield from the urban-affected cells compared with that from the rural (control) cells. The excess was greatest in moderate to heavy storms and apparently resulted most often from enhancement of the natural atmospheric rainfall processes in organized weather systems. The 25-mm rainstorms showed a pronounced maximum of occurrence in a region that frequently lies downwind of two urban-industrial areas, St. Louis and Alton-Wood River. It was concluded that the frequency distribution of heavy rainfalls may vary significantly between urban, suburban, and rural areas in large urban-industrial regions and that this may necessitate reevaluation of sewer design storm parameters in current use. (Jones-ISWS)
W76-06680

THE EFFECT OF FOREST ON MINIMUM RIVER RUNOFF IN THE BROAD-LEAVED FOREST ZONE AND FOREST-STEPPE OF THE EUROPEAN PART OF THE USSR, (IN RUSSIAN),
G. S. Pimenova.
Lesove Denie 2, p 3-10, 1975.

Descriptors: *Runoff, Rivers, Europe, Forests, *Forest management, Grasslands, Soil moisture.
Identifiers: *USSR.

Data on the minimum runoff of small rivers in the broad-leaved zone and the forest-steppe from comparison of river basins with constrasting degrees of afforestation show that large tracts of forest are of great importance in increasing the undergroung water supply. In the central part of the forest-steppe, minimum river runoff in basins with greater afforestation is almost equal. The prevalence of an unsaturated soil moisture regime in the South is noted.--Copyright 1975, Biological Abstracts, Inc.
W76-06783

4D. Watershed Protection

FORMATION OF WATER AND SEDIMENT DISCHARGE DURING THE SPRING FLOOD ON A SLOPE AND IN A SMALL GULLY-RAVINE DRAINAGE BASIN,
For primary bibliographic entry see Field 2J.
W76-06176

SEDIMENT RESERVOIRS IN THE CHANNELS OF SMALL MOUNTAIN RIVERS,
For primary bibliographic entry see Field 2J.
W76-06177

SUBARCTIC PLANT COMMUNITIES AND ASSOCIATED LITTER AND SOIL PROFILES IN THE CARIBOU CREEK RESEARCH WATERSHED, INTERIOR ALASKA,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
J. L. Troth, F. J. Deneke, and L. M. Brown.

Available from the National Technical Information Service, Springfield, Va 22161, as ADA-009 063, $4.00 in paper copy, $2.25 in microfiche. Research Report 330, March 1975. 25 p, 3 fig, 8 tab, 25 ref, 4 append.

Descriptors: *Watersheds(Basins), *Vegetation, *Soil chemistry, *Alaska, Forests, Trees, Plant populations, Cold regions, Soil chemical properties, Humus, Organic matter, Ecology, Hydrology, Soil profiles.
Identifiers: *Caribou Creek watershed(Alas).

Studies were completed in several black spruce and aspen/birch communities of the Caribou Creek Watershed. Frequency and basal area or percent cover were detailed for tree, sapling, shrub, herbaceous, moss, and lichen species. Organic layer mass was greatest beneath a north slope black spruce community. Carbon and nitrogen levels were higher in litter layers beneath the hardwook stands, whereas carbon/nitrogen ratios were higher in the living and decaying organic mat beneath black spruce. Concentrations of P, Ca, Mg, Mn and Zn were higher in hardwood than in conifer organic layers. K and Fe concentrations in organic layers were similar beneath hardwoods and conifers. Soils beneath conifer and hardwood stands could not be separated on the basis of pH, %C, %N, or C/N ratios. Cation exchange capacity closely reflected %C in all soils. More exchangeable bases were present in soils beneath hardwood communities than beneath black spruce communities. Increases in extractable P were found near the soil surface in aspen-dominated communities. Extractable soil P increased below 15 cm in conifer stands. (Sims - ISWS)
W76-06194

MORE WATER FOR ARIZONA.
Arizona Water Resources Committee, Phoenix; and Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 3B.
W76-06261

THE WATERSHED APPROACH TO UNDERSTANDING OUR ENVIRONMENT,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 5G.
W76-06311

MINE SPOIL RECLAMATION RESEARCH AT THE BELLE AYR MINE, NORTHEAST WYOMING,
Forest Service (USDA), Fort Collins. Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 5G.
W76-06361

RECOVERY FROM SOIL COMPACTION ON BLUEGRASS RANGE IN THE BLACK HILLS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. K. Orr.
Transaction of the ASAE, (American Society of Agricultural Engineers) Vol. 18 No. 6: p 1076-1081, 1975. 10 fig, 4 tab, 10 ref.

Descriptors: *Soil compaction, *Soil physical properties, Grazing, Grasslands, Surface runoff, Range management, *South Dakota.
Identifiers: *Black Hills, *Bluegrass bottoms, Livestock trampling, Soil recovery, Range hydrology.

Not until the second year after fencing did soils on heavily grazed bluegrass range show significantly more macro-pore volume and/or reduced bulk density. Under protection the infiltration capacities also increased and summer storm runoff decreased. More than one year of protection from trampling is needed for significant recovery from soil compaction, a matter of considerable importance in grazing management. (Forest Service)
W76-06362

TREND SURFACE ANALYSIS OF POWDER RIVER BASIN, WYOMING - MONTANA,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-06363

SEDIMENT DATA, CANADIAN RIVERS 1972.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
For primary bibliographic entry see Field 7C.
W76-06376

A MODEL TO PREDICT THE PERFORMANCE OF FEEDLOT RUNOFF CONTROL FACILITIES AT SPECIFIC OREGON LOCATIONS,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-06382

COMPUTING PHREATIC GROUNDWATER STORAGE,
Agricultural Research Service, Tifton, Ga.
For primary bibliographic entry see Field 2F.
W76-06409

RAINFALL-RUNOFF DATA FROM SMALL WATERSHEDS IN COLORADO, OCTOBER 1971 THROUGH SEPTEMBER 1974,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-06446

THE EFFECT OF LAND USE ON THE CHEMICAL AND PHYSICAL QUALITY OF SURFACE AND GROUND WATERS IN SMALL WATER SHEDS,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 5B.
W76-06552

EVALUATION OF POLLUTION ABATEMENT TECHNIQUES APPLICABLE TO LOST CREEK AND BROWN'S CREEK WATERSHED, WEST VIRGINIA.
Ackenheil and Associates Geo Systems, Inc., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W76-06570

SOIL EROSION AND SEDIMENTATION IN TANZANIA AND LESOTHO,
Secretariat for International Ecology, (Sweden).
A. Rapp.
Ambio, Vol. 4, No. 4, p. 154-163, 1975. 9 fig, 1 tab, 17 ref.

Descriptors: *Soil erosion, *Sedimentation, *Africa, *Land management, *Land use, *Erosion control, Soil conservation, Surface runoff, Natural resources, Water resources development, Water utilization, Ecology, Environmental effects, Vegetation, Watershed management, Sedimentation rates.
Identifiers: Tanzania, Lesotho.

One of the necessary lines of action to change the negative trend of food and water shortages in many African countries is an improved and ecologically sound use of the natural resources of water, vegetation, and productive soil. In order to study types of soil erosion, monitor present rates of erosion and determine consequences of erosion, it is necessary to carry out continuous studies of water and sediment flow in natural watersheds under different environmental conditions and different types of land use. These studies or 'catchment diagnoses' provide a sound basis for reclamation plans, which must be adapted to the local ecological and social conditions to be successful. Every land and water development scheme should be combined with critical evaluation of its impact on the environment and on man. In particular, the reactions of the environment to exploitation should be observed and conclusions drawn for better land use from these observations. In order to compare the situation before, during and after implementation of a plan, reliable reference data such as maps, photographs and descriptions must be obtained for land and water development projects. Initial mistakes can then be recognized and corrected by means of repeated comparisons or monitoring. (Robinett-Arizona)
W76-06593

INFLUENCE OF VESICULAR HORIZONS ON WATERSHED MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Range Science.
W. H. Blackburn, R. E. Eckert, Jr., M. K. Wood, and F. F. Peterson.
In: Watershed Management Proceedings Irrigation and Drainage Division American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p. 494-515. n.d. 11 fig, 7 tab, 6 ref.

Descriptors: *Soil horizons, *Soil surfaces, *Sediment yield, *Infiltration rates, *Plant growth, *Watershed management, Soil erosion, Arid lands, Organic matter, Topsoil, Ranges, Soil physical properties, Wettability, Soil structure, Soil strength.
Identifiers: *Seedling emergence, *Vesicular horizons.

Vesicular soil surface horizons are found extensively on arid and semiarid range lands in poorly aggregated dune interspace soils (dune interspace is the area between areas of accumulation of litter and soil under trees, shrubs and bunchgrasses). Vesicular horizons are the major factor contributing to low infiltration rates and sediment production from large areas of rangeland. The influence of vesicular horizons on infiltration rates, sediment production, and seedling emergence is discussed. Areas of litter and soil accumulation had infiltration rates near or exceeding the application rate of 3 inches per hour and sometimes 3 to 5 times greater than the dune interspace areas. Sediment is usually considerably higher from dune interspace areas than from areas of accumulation and as dune interspace areas increase, sediment production increases. More sediment is produced from initially wet soils than those initially dry. This relationship is most marked for soils with a vesicular surface horizon. Seedling emergence was higher in areas of accumulation than in interspace soils. A decrease in organic matter content increased crust hardness, while an increase in the number of water applications decreased hardness. (Robinett-Arizona)
W76-06596

MANAGING CHAPARRAL FOR WATER AND OTHER RESOURCES IN ARIZONA,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W76-06597

VEGETATION MANAGEMENT FOR WATER AND RANGE IMPROVEMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W76-06598

BLACK RIVER BAROMETER WATERSHED - ITS RELATION TO THE RESOURCE MANAGER,
Forest Service (USDA), Springerville, Ariz. Apache-Sitgreaves National Forest.

T. Stewart.
: Watershed Management Proceedings Irrigation
d Drainage Division American Society of Civil
ngineers, August 11-13, 1975, Logan, Utah, p.
7-215. n.d. 2 tab.

escriptors: *Watershed management, *Water
eld, *Demonstration watersheds, *Regional
alysis, *Natural resources, *Arizona, Land
anagement, Surface runoff, Conservation, Cli-
atic data, Hydrologic data, Planning, Manage-
ent, Water resources, Land use, Training.
entifiers: *Black River Barometer
atershed(Ariz), Barometer watersheds.

e barometer watershed discussed is in Region 3
the U.S. Forest Service on the Apache-Sit-
eaves National Forests in east central Arizona.
e primary thrust of the barometer watershed
ogram is discussed. These watersheds are
signed to be an index or a representative sample
each broad climatic-physiographic region and
ll be 30,000 to 150,000 acres in size so as to con-
n continuing programs of timber management,
estock grazing, recreation, wildlife and fishery
bitat management, road and trail development,
d other interrelated activities. The objectives of
Black River Barometer Operational Plan are:
management services, in which the ability to
ect changes in water yield due to land use is
aluated; (2) improving methods and techniques
d by soil scientists and hydrologists and adapt-
them to the requirements for use in the
thwestern region; (3) to establish a
drometeorological data bank; and (4) training
aluation and demonstration. (Robinett-Arizona)
6-06599

ENTIFICATION AND TREATMENT OF SPERSIVE CLAY SOILS,
lahoma State Univ., Stillwater. School of Civil
gineering.
primary bibliographic entry see Field 8D.
6-06611

IL STABILIZATION FOR EROSION CON-OL,
due Univ., Lafayette, Ind. School of Civil En-
eering.
Diamond, and M. Kawamura.
ilable from the National Technical Informa-
Service, Springfield, Va. 22161 as PB-242 842
0 in paper copy, $2.25 in microfiche. Joint
hway Research Project 74-12, August 1974. 115
6 fig, 6 tab, 17 ref.

criptors: *Erosion control, *Soil stabilization,
sion, Erosion rates, Simulated rainfall, Port-
cements, Lime, Construction.
tifiers: *Rainfall-erosion, Construction ero-
control, Erosion tests, Aggregated size analy-
Crosby soil, Soil loss.

potential utility of small percentages of
ated lime or of Portland cement in stabilizing
truction sites against rainfall erosion is under
stigation. A laboratory rainfall simulator has
designed and constructed to provide a
oducible 'design storm' (3.25 in per hour inten-
applied for 1 h on each of two successive
). The design, development, and testing of the
all simulation equipment and of the as-
ated sample preparation and test devices was
ribed in Part I of this report; Part II described
experimental results as of November 1973.
er the test conditions unstabilized (but com-
ed) Crosby soil eroded to the equivalent of
t 90 tons/acre. Treatment with 2.5% cement
ally eliminated soil loss; the same level of
ment with hydrated lime reduced it to the
valent of about 3 tons/acre, but a curing time
veral weeks was required. Even smaller per-
ges, down to 1%, resulted in significantly
ced erosion. A test stand of Alta fescue grass
e same soil was not as effective as the cement
e treatments. (Lee - ISWS)
06639

STABILIZATION OF CLAY SOILS AGAINST EROSION LOSS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
M. Kawamura, and S. Diamond.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-242 841 $4.00 in paper copy, $2.25 in microfiche. Joint Highway Research Project Report No. 75-4, March 1975. 31 p, 12 fig, 14 ref. FHA C-36-50H.

Descriptors: *Erosion control, *Clays, Erosion, Highways, Soil erosion, Porosity, Rainfall, Raindrops, Lime, Portland cements.
Identifiers: *Hydrated lime stabilization, *Portland cement stabilization, Erosion resistance, Pore size distribution, Erosion soil loss, Soil loss, Water-stable aggregate distribution, Scanning electron microscope observations.

Accelerated soil erosion from construction sites and the resulting increase in downstream sediment load constitutes a significat environmental problem. Laboratory studies indicated that small percentages of hydrated lime or of Portland cement will stabilize clay soils against rainstorm erosion by preventing particle detachment. Coordinated measurements of the size distribution of water-stable aggregates, of pore size distribution by mercury porosimetry, and of microstructure by scanning electron microscopy and energy dispersive x-ray spectrometry were used to clarify aspects of the mechanisms responsible for the development of erosion resistance. Attainment of such resistance was marked by aggregation of a significant part of the clay into water stable aggregations of the order of several millimeters in size, and of minimal change in porosity and pore size distribution on exposure to the test rainstorms. At least some of the clay particles in the aggregations appeared to be partly converted to calcium-bearing reaction products, and formation of the 'reticulated network' variety of calcium silicate hydrate gel linking adjacent particles was demonstrated. (Lee-ISWS)
W76-06640

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

SALINITIES OF AMBIENT AND INTERSTITIAL WATERS OF SOME MASSACHUSETTS NORTH SHORE SALT-MARSHES,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5B.
W76-06158

REGIONAL DISTRIBUTION OF THE MAJOR DISSOLVED SOLIDS IN THE STREAMS OF ILLINOIS,
Northern Illinois Univ., De Kalb. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-06163

ACETYLENE REDUCTION ASSAYS FOR NITROGEN FIXATION IN FRESHWATERS: A NOTE OF CAUTION,
Manitoba Univ., Winnipeg. Dept. of Microbiology.
R. J. Flett, J. W. M. Rudd, and R. D. Hamilton.
Applied Microbiology, Vol. 29, No. 5, p. 580-583, 1975. 4 fig., 13 ref.

Descriptors: *Analytical techniques, *Nitrogen fixation, *Methane bacteria, On-site investigations, Metabolism, Oxidation, Assay, *Pollutant identification.
Identifiers: *Acetylene reduction, Ethylene.

Since organisms fixing molecular nitrogen also reduce acetylene to ethylene, gas chromatographic determination of both gases are generally used to indirectly assess nitrogen fixation, but reproducible recovery of ethylene produced in acetylene reduction assays is essential. Microorganisms oxidizing methane in lakes were studied to determine if they could use ethylene. Lake samples transformed C14 ethylene into water soluble compounds undetectable by conventional acetylene reduction procedures; methane-oxidizing bacteria appeared responsible. About 28% of added ethylene was transformed and this figure is probably an underestimate. Depth distributions of methane-oxidizing and ethylene-transforming activities, temperature response curves, and substrate competition experiments indicated that the same organisms mediated methane oxidation and ethylene transformation. Whenever and wherever methane-oxidizing bacteria are active, acetylene reduction assays may be erroneus due to ethylene transformation. Metabolized ethylene was not incorporated into cellular material. Some metabolites were water-soluble, non-volatile compounds; carbon dioxide was not a major end-product. The assumption that ethylene produced during assay is not biologically or abiologically altered during incubation is sometimes invalid, causing errors in acetylene reduction assays used in environments containing methane-oxidizing bacteria. More confidence could be placed in acetylene reduction assays if ethylene stability were demonstrated by radiochemical techniques. If ethylene transformation occurred, only N15 techniques could be accurately used. (Buchanan-Davidson--Wisconsin)
W76-06202

NATIONAL EUTROPHICATION SURVEY METHODS FOR LAKES SAMPLED IN 1972.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-06221

THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME IX. OCEANS.
Econ, Inc., Princeton, N. J.
For primary bibliographic entry see Field 7B.
W76-06222

A METHOD OF DETERMINING MORPHOPHYSIOLOGICAL INDICATORS IN THE ECOLOGY OF ROTIFERS (ROTATORIA), (IN RUSSIAN),
Y. S. Chuikov.
Ekologiya 5(5), p 95-97. 1974.

Descriptors: *BioindicatorS, *Rotifers, Methodology, Ecology, Animal physiology, Microbiology, Eutrophication, Production.
Identifiers: Keratella-Quadrata-Frenzeli, Keratella-Quadrata-Quadrata, Lorica, Rotatoria.

The isolation of some morphological indices, expressing the interaction of internal and external factors for rotifer populations as indicators of ecological conditions, is proposed. In addition to such external morphological indices as the shape and dimensions of the lorica and its formations, indices of the physiological state of internal organs are also valuable: form and size of the gonads, form of the ovarian nucleus and the gastric glands, number and dimensions of eggs or embryos, periods of latent egg production and, to a certain extent, the gnathic apparatus. The use of this method of morphophysiological indicators in studies associated with the anthropogenic eutrophication of waters is illustrated using Keratella quadrata quadrata and K. quadrata frenzeli.--Copyright 1975, Biological Abstracts, Inc.
W76-06231

PUBLIC GROUNDWATER SUPPLIES IN PUTNAM COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-06237

THE USE OF CHITOSAN COLUMNS FOR THE REMOVAL OF MERCURY FROM WATERS,
Ancona Univ. (Italy). Faculty of Medicines and Ancona Univ. (Italy). Chemistry Lab.
R. A. A. Muzzarelli, and R. Rocchetti.
J Chromatogr. 96(1): 115-121. Illus. 1974.

Descriptors: *Mercury, *Analytical techniques, *Radiochemical analysis, *Spectrometry, Absorption.
Identifiers: Chitosan columns, Eluting agents, Flameless atomic absorption.

The experimental conditions for the removal of ionic Hg from waters were studied. Columns containing 1-15 g of chitosan were used to lower the Hg concentration from 1-0.02 ppm, with volume reduction factors of 2000-10,000. Recycling of columns was carried out with 10 mM potassium iodide solution. Other inorganic and organic eluting agents were studied. The analytical instrumental techniques were flameless atomic-absorption spectrometry and radiochemistry.--Copyright 1975, Biological Abstracts, Inc.
W76-06239

PUBLIC GROUNDWATER SUPPLIES IN MACOUPIN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-06257

EVIDENCE FOR NEW ALUMINUM PHOSPHATE PHASE FROM REACTION RATE OF PHOSPHATE WITH ALUMINUM HYDROXIDE,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soils and Fertilizers.
For primary bibliographic entry see Field 5E.
W76-06295

A TECHNIQUE FOR ESTIMATING ACTIVE NITRIFYING MASS AND ITS APPLICATION IN DESIGNING NITRIFYING SYSTEMS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
E. G. Srinath, T. B. S. Prakasam, and R. C. Loehr.
In: Proceedings of the 29th Industrial Waste Conference, Part Two, May 7-9, 1974, Lafayette, Indiana, Purdue University, p 1038-1048. 7 fig, 3 tab, 14 ref.

Descriptors: *Analytical techniques, *Nitrification, *Nitrogen, *Nitrites, Suspended solids, *Pollutant identification, Waste water treatment, Sludge, Aerobic treatment, Oxidation, Microorganisms.
Identifiers: Total Kjeldahl nitrogen, Mixed liquor volatile suspended solids, Nitrosomonas, Nitrobacter.

Various methods are available for estimating the active mass of the sludge in an aerobic treatment process, based on the biochemical characteristics of the aerobic organisms. In nitrifying systems, mixed liquor volatile suspended solids (MLVSS) is used as the parameter and is usually very crude. Results from research on the process of nitrification were used to develop a parameter for the active mass of nitrifying organisms. The oxidation rates of ammonium and nitrite of the mixed liquors (expressed as milligrams of substrate nitrogen oxidized per hour per milligram of cellular total Kjeldahl nitrogen (TKN) of the mixed liquor) were compared with the rates obtained with pure cultures of Nitrosomenas europaea, Nitrobacter agilis, and N. winogradskyi suspended at known concentration (milligrams of cellular TKN/liter) in a mineral salt medium containing their respective substrates, ammonium and nitrite. The reference pH for determining the rates was in the range of 7.4 to 7.9 since the maximum rates were obtained in this range. The ratio between the specific rates of oxidation of the mixed liquor nitrifying population and the pure cultures under similar conditions of pH and temperature represents the fraction of the TKN of the mixed liquor as contributed by the cellular TKN of the autotrophic nitrifiers. This ratio when multiplied by the TKN concentration of the mixed liquor, gives the TKN concentration of the nitrifying organisms, which can be used as an estimate of their mass. (Pinto-FIRL)
W76-06296

NITROSOPHENOL AND NITROSONAPHTHOL DERIVATIVES AS REAGENTS FOR SPECTROPHOTOMETRIC DETERMINATION OF IRON AND DETERMINATION OF MICRO-AMOUNTS IN WATERS WITH 2-NITROSO-5-DIMETHYLAMINOPHENOL,
Okayama Univ. (Japan). Dept. of Chemistry.
K. Toei, S. Motomizu, and T. Korenaga.
The Analyst, Vol. 100, No. 1194, p 629-636, September, 1975. 5 tab, 38 ref.

Descriptors: *Spectrophotometry, *Analytical techniques, *Nitrogen compounds, Iron, *Pollutant identification, Rivers.
Identifiers: Nitroso compounds.

The iron(II) complexes of twenty-five nitroso compounds were examined spectrophotometrically in aqueous solution for suitability as analytical reagents for iron(II) ion. Although most of the complexes with nitroso compounds had a 1:3 composition in aqueous solution and chloroform, two complexes, nitroso-DMAP and nitroso-DEAP, had a 1:4 composition. Because of this, and because the ligands possess strong electron-donating groups, the molar absorptivities of the two complexes were very large. Although the molar absorptivity of the nitroso-DEAP complex was slightly larger than that of the nitroso-DMAP complex, the latter is more useful for the determination of micro-amounts of iron. Nitroso-DMAP is more stable, and the color of its complex with iron(II) in aqueous solution is stable for much longer than nitroso-DEAP. A spectrophotometric method using nitroso-DMAP was applied to the determination of iron in city and river waters. The method possessed several advantages. The complex formed had a molar absorptivity about four times as large as that formed with 1,10-phenanthroline. Diverse ions which are generally present in natural waters did not interfere in the determination. The nitroso-DMAP complex had a wide range of pH in which the full color developed, and the simplicity of the procedure allowed measurements to be carried out in aqueous solution. (Loustau-FIRL)
W76-06303

CADMIUM AND ZINC CONTENTS OF CORN LEAF AND GRAIN PRODUCED BY SLUDGE-AMENDED SOIL,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
R. L. Jones, T. D. Hinesly, E. L. Ziegler, and J. J. Tyler.
Journal of Environmental Quality, Vol. 4, No. 4, p 509-514, October/December, 1975. 5 fig, 3 tab, 10 ref.

Descriptors: *Cadmium, *Zinc, *Sludge treatment, *Soil analysis, Hydrogen ion concentrations, Sludge disposal, *Pollutant identification, Environmental effects, Anaerobic digestion.
Identifiers: Land application, Atomic absorption analysis.

Because the cadmium present in sludge-amended soil presents a hazard to plant and animal ecosystems, the patterns of concentrations of cadmium in plants have been related to soil pH. In animal and plant physiology, zinc is important to consideration of transport of cadmium across membranes, and levels of zinc in plant tissues were also reported. Sludge from high-rate anaerobic digestors was applied to three out of four plots of corn. Leaves and grains of the corn were sampled, and yield determinations were made. In addition, soil samples were taken. Cadmium and zinc were determined in the samples by atomic absorption analysis. The pH was determined from the soil samples in distilled water solutions. Decline in yield was the first apparent effect of some elemental excess. Increases in extractable cadmium and zinc from the sludge-amended soils was also a result. Uptake of cadmium was substantial in the case of leaves. Mechanisms appeared to operate in diminishing the concentration of cadmium in grains. Zinc contents resembled results for cadmium. Soil pH was found to interact significantly with cadmium levels in the soil to affect cadmium levels in the leaves. The interaction between pH and zinc has long been known. An important new observation was that above pH 7 when large amount of zinc were available, increases in cadmium levels in leaves were not observed. Substantial increases in zinc content could undoubtedly mediate any negative effects of sludge-enhanced cadmium levels. Furthermore, sludges that would be applied to plants for nutrients would be applied in considerably smaller amounts. (Loustau-FIRL)
W76-06304

CHEMICAL ANALYSIS AND ENVIRONMENTAL QUALITY,
H. Egan.
Chemistry and Industry, No. 19, p 814-820, October 4, 1975. 44 ref.

Descriptors: *Water analysis, *Analytical techniques, *Pollutant identification, Chemical analysis, Monitoring, Measurement, Water quality.

Chemical analysis can provide a measurement of the various factors which need to be taken into account in evaluating environmental quality. It can measure the level of substances, usually trace substances, which intrude in the atmospheric, aquatic or terrestrial environment, and can contribute to an understanding of the possible interactions between these factors. This article discusses various chemical monitoring methods: electro-optical devices based on ultraviolet absorption for measuring sulfur dioxide; a flame-photometric detector for sulfur compounds; infrared gas analysis and chemical reaction for measuring carbon monoxide; and, lazers for monitoring ozone, ethylene and other trace constituents in the atmosphere. Analytical methods for monitoring pollutants in aquatic environments include atomic absorption, atomic fluorescence, atomic emission and mass spectrometry, and neutron activation analysis. Study of the terrestrial environment has brought about the development of new multidetection or multiresidue methods such as gas-liquid chromatographic multidetection. There is evidence growing interest in the monitoring of the total environment by remote sensing techniques. (Loustau-FIRL)
W76-06308

A FEW CONSIDERATIONS ON THE MEASUREMENT OF PORE SIZE DISTRIBUTION OF ACTIVATED CARBON (KASSEITAN NO SAIKOKEI BUNPU SOLUTEI NI KANSURU NO KOSATSU),
For primary bibliographic entry see Field 5D.
W76-06309

MEASUREMENT IN WATER RESEARCH PART 1.
Measurement and Control, Vol. 8, No. 11, p 441, November, 1975. 1 fig.

Descriptors: *Water analysis, *Pollutant identification, *Analytical techniques, Heavy metals, Equipment, Instrumentation.

The Water Research Centre, Buckinghamshire, U. K., is responsible for all aspects of water supply and disposal including resources, potable water treatment, quality, and distribution, sewage treatment, industrial wastes treatment, water pollution, and sewerage.Some of the techniques used at the WRC to identify pollutants are described. A gas chromatography/mass spectrometer is used to measure organic compounds such as oils, plastics, and pesticides. Although glass capillary columns have many advantages over the stainless steel columns usually used in hydrocarbon analysis, the experimental difficulties associated with their preparation and their limited commercial availability have inhibited their use. The WRC is investigating the application of some newer types of glass columns for research and routine work in water analysis. High-pressure liquid chromatography permits materials at low concentrations to be determined relatively easily. The WRC is evaluating a flameless atomic absorption spectrometry technique for the determination of trace metals. Anodic stripping voltammetry is an electroanalytical technique for the determination of trace metals; it has been used for the analysis of potable water, seawater, and sewage and sewage effluents. Emission spectrographic analyses were performed on water samples from rivers in England and Wales to determine the baseline concentrations of trace metals in these rivers. (Orr-FIRL)
W76-06310

EARTHWATCH,
National Oceanic and AtmosphericAdministration, Rockville, Md. Deep Water Ports Project Office.
J. E. Jensen, D. W. Brown, and J. A. Mirabito.
Science, Vol. 190, No. 4213, p 432-438, October 31, 1975. 6 fig, 1 tab, 22 ref.

Descriptors: *Monitoring, *Data collections, Research and development, *Information exchange, Environmental effects, Water pollution, Air pollution, *Pollutant identification.
Identifiers: *Earthwatch.

Earthwatch, part of the United Nations Environment Program, is a four-part program involving monitoring, research, evaluation, and information exchange. The program, which was created in June, 1972, will provide the basis for global environmental management and supporting measures. The monitoring aspect of Earthwatch will be done at stations all over the world and in connection with organizations already established by the United Nations. Research activities include atmospheric research, and oceanic exploration. Information exchange will complement the activities and services already provided by the World Data Center. Eventually the framework for Earthwatch will be nongovernmental assessment centers around the world. (Loustau-FIRL)
W76-06321

TRACE ELEMENT CONCENTRATIONS OF SEWAGE TREATMENT PLANT EFFLUENTS AND SLUDGES; THEIR INTERACTIONS WITH SOILS AND UPTAKE BY PLANTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-06332

BEHAVIOUR OF OIL UNDER CANADIAN CLIMATIC CONDITIONS PART 1. OIL ON WATER UNDER ICE-FORMING CONDITIONS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5G.
W76-06366

EXAMINATION OF SEWAGE AND SEWAGE SLUDGE FOR ENTEROVIRUSES, VOLUME 1.
Ontario Ministry of Health, Toronto.
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 27, Training and Technology Transfer Division (Water), Environmental Protection Service, Environment Canada, Ottawa, Canada, March 1975, 35 p, 11 tab, 47 ref. 72-5-1.

Descriptors: *Sewage sludge, Sewage, Pollutants, Environment, Microorganisms, Electron microscopy, Nutrients, Heavy metals, *Pollutant identification.
Identifiers: *Enteroviruses, *Agricultural land, Chloroform, Poliovirus, Vaccines, Urban sewage, Rural land.

A promising and practical method for taking advantage of the nutrient qualities of sewage sludge is to spread it on agricultural or grass land in rural areas. This method, however, carries an inherent risk that the environment may be polluted further with harmful agents such as viruses and heavy metals. This report deals with the first phase of a virus monitoring program being carried out in the Enterovirus Laboratory of the Ontario Ministry of Health, in connection with the plans to spread urban sewage sludge on rural land in Ontario. The results of this program include virus surveillance studies on five Ontario plants which employ different phosphate removal techniques, as well as related laboratory studies. (Environment Canada)
W76-06371

WATER QUALITY DATA ALBERTA 1961 - 1973.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 7C.
W76-06374

SODIUM, POTASSIUM, CALCIUM AND MAGNESIUM CONTENT OF NORTHWEST ARKANSAS RAIN WATER IN 1973,
Arkansas Univ., Fayetteville. Dept. of Geology.
For primary bibliographic entry see Field 2B.
W76-06379

CHROMATOGRAPHIC DETERMINATION OF DMA AND DMF IN AQUEOUS MEDIUM,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Petroleum Technology and Petrochemistry.
V. Kubelka, J. Mitera, V. Rabl, and J. Mostecky.
Water Research, Vol. 10, No. 2, p 137-138, February 1976. 2 tab, 12 ref.

Descriptors: *Pollutant identification, *Gas chromatography, *Mass spectrometry, *Analytical techniques, *Instrumentation, *Organic compounds, Analysis, Chromatography, Chemistry, Evaluation, Water analysis, Water chemistry, Water quality, Estimating, Pollutants, Chemical analysis, Water pollution, Aqueous solutions.
Identifiers: *Dimethylamine(DMA), *Dimethylformamide(DMF), Flame-ionization detector, Total ionic current, Collector current, Organic sorbents.

The reliability of data on the contents of dimethylamine (DMA) and dimethylformamide (DMF) in water using gas chromatography and the gas chromatograph-mass spectrometer combination was assessed. Regarding the practical requirements of the industry, attention was concentrated on the concentration range of 0 to 500 mg/l. Using gas chromatograph with the flame-ionization detector, hundreds of ppb of DMA and the ppm level of DMF can be determined in aqueous solutions. With gas chromatography-mass spectrometer system, monitoring the total ionic current, similar concentrations are detectable as with the flame-ionization detector, but the detection limit is substantially lowered to 10 ppb for both DMA and DMF, when the collector current is monitored. (Henley - ISWS)
W76-06390

SEMI-AUTOMATED AMMONIA PROBE DETERMINATION OF KJELDAHL NITROGEN IN FRESHWATERS,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
R. J. Stevens.
Water Research, Vol. 10, No. 2, p 171-175, February 1976. 3 fig, 1 tab, 18 ref.

Descriptors: *Ammonia, *Analytical techniques, *Membranes, *Nitrogen compounds, *Water analysis, Ammonium compounds, Nitrogen, Inorganic compounds, Analysis, Membrane processes, Chemical analysis, Color reactions, Chemistry, Evaluation, Instrumentation, Testing procedures, Distillation, Freshwater, Spectrophotometry, Automation.
Identifiers: *Ammonia probe, *Specific ion electrode, *Kjeldahl nitrogen, Technicon autoanalyzer, Distillation-Nesslerisation, Polytetafluoroethylene membrane, Kjeldahl method, Automated digestion, Flow-through system.

A commercially available ammonia probe was used in an automated continuous flow-through system to determine the ammonia-N concentration in Kjeldahl digests of fresh waters. The method is suitable for samples with Kjeldahl-N concentrations greater than 0.1 mg N/l. In the 0.1-1.0 mg N/l range 10 digests/h can be analyzed. Only microdigestion equipment and sample volumes of 25 ml are required. The ammonia probe with modified filling solution and polytetafluoroethylene membrane is sufficiently stable for continuous use throughout a working day. Analyses of Kjeldahl digests of freshwater samples by this method and the distillation-Nesslerisation procedure showed good agreement. More precise results were obtained by the ammonia probe method. The ammonia probe method obviates the steam-distillation operation which is time-consuming and during which errors can be easily introduced by loss or gain of ammonia. (Henley-ISWS)
W76-06391

GROUND-WATER QUALITY IN SELECTED AREAS SERVICED BY SEPTIC TANKS, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-06442

THE LOWER WILCOX AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-06444

THE MIOCENE AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-06445

WATER RESOURCES OF THE THRUST BELT OF WESTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 7C.
W76-06448

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1975,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 7C.
W76-06451

SOUTHEASTERN MICHIGAN WATER-RESOURCES STUDY: GROUND WATER AND GEOLOGY,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 4B.
W76-06457

PROGRESS REPORT ON THE WATER RESOURCES INVESTIGATION OF MARTIN COUNTY, FLORIDA,
Geological Survey, Tallahasee, Fla.
For primary bibliographic entry see Field 4B.
W76-06459

MULTIVARIATE AND SEQUENTIAL STATISTICAL PROCEDURES IN THE BIOLOGICAL ASSESSMENT OF WATER QUALITY,
Colorado State Univ., Fort Collins. Dept. of Statistics.
T. T. Keefe, and E. P. Bergersen.
August 1975. 82 p, 20 fig, 13 tab, 57 ref, append. 14-06-D-7550.

Descriptors: *Water quality, *Statistical methods, *Graphical analysis, Fish behavior, *Biological communities, Aquatic communities, *Bioindicators.
Identifiers: *Species diversity.

Research on the application of multivariate and sequential statistical procedures in the biological assessment of water quality is described. Graphical presentation of bivariate statistical analysis was developed and found to be ideal for the interpretation of biologically based water quality data where two responses can be measured on the same experimental unit. A progress statement on the suitability of a graphical trivariate approach to assessing water quality is also presented. A technique for graphical display of R x 3 contingency tables was applied to the problem of detecting differences among aquatic communities with respect to functional biological groups and was found to be well-suited for visually inspecting such differences. Confidence interval estimation of White's measure of association between two categorical variables was developed and applied to an evaluation of fish movements in response to changing water quality. To facilitate the application of the Sequential Comparison Index (SCI), several procedures, based on statistical designs, are presented for sample selection and processing. Sequential statistical procedures were found to be a potentially time-and-cost saving technique for biologically assessing water quality; application of this technique with SCI data was shown to provide a rapid first approach to identifying station differences in species diversity. (Bureau of Reclamation)
W76-06561

ACROLEIN RESIDUES IN IRRIGATION WATER AND EFFECTS ON RAINBOW TROUT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 5C.
W76-06563

IN REGARD TO THE QUESTION OF THE DETERMINATION OF HEAVY METALS IN RIVER WATERS WITH THE AID OF RADIONUCLIDE X-RAY FLUORESENCE ANALYSIS, (IN GERMAN),
Staatliches Forchungsinstitut Geochemisches, Bamberg (West Germany).
H. Meier, E. Unger, W. Albrecht, D. Boesche, and W. Hecker.
Mikrochim Acta 5/6, p 505-518, 1975.

Descriptors: *Pollutant identification, *Heavy metals, Rivers, *X-ray fluorescence, Radioisotopes, Sediments, Suspended solids.

The fundamentals of energy-dispersive X-ray fluorescence analysis involving radioactive nuclide sources in combination with Si(Li) semiconductor detectors or proportional counter tubes are discussed. Examples are given to show that the procedure is suitable for the rapid determination of dissolved or suspended pollutants of river waters and sediments. Direct analysis of water samples and analysis of specimens without preliminary chemical treatment by evaporation or centrifugation are possible. Concentrations of 0.1 ppm are the detection limits.--Copyright 1975, Biological Abstracts, Inc.
W76-06619

TAXONOMY OF KLEBSIELLA PNEUMONIAE ISOLATED FROM PULP/PAPER MILL WASTE-WATER,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-06645

ENVIRONMENTAL APPLICATIONS OF ADVANCED INSTRUMENTAL ANALYSIS: ASSISTANCE PROJECTS, FY 74,
Southeast Environmental Research Lab., Athens, Ga.
A. L. Alford.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-247 056, $4.00 in paper copy, $2.25 in microfiche. Report EPA-660/4-75-004, June 1975. 30 p, 10 tab, 10 ref. EPA 1BA027; 16020 GHZ.

Descriptors: Water pollution sources, *Pollutant identification, *Analytical techniques, Industrial wastes, Gas chromatography, Mass spectrometry, Neutron activation analysis, *Instrumentation, Measurement.
Identifiers: Spark source mass spectrometry, Multi-element analysis.

The Analytical Chemistry Branch of the Southeast Environmental Research Laboratory identified and measured aquatic pollutants under seven projects in answer to requests for assistance from other EPA organizations and other government agencies. In most cases these analyses helped to solve, or at least to understand more clearly, the related pollution incident and in some cases provided evidence for enforcement of regulatory legislation. Under an additional project, analytical consultations were held as requested by various organizations concerned with pollution incidents. (EPA)
W76-06647

ANALYTICAL QUALITY ASSURANCE FOR TRACE ORGANICS ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY,
Environmental Monitoring and Support Lab., Cincinnati, Ohio.
J. W. Eichelberger, W. M. Middleton, and W. L. Budde.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 823, $3.50 in paper copy, $2.25 in microfiche. Report EPA-600/2-75-007. September 1975. 12 p, 4 fig, 2 tab, 7 ref. 1BA027; ROAP 09ABZ; Task 001.

Descriptors: Potable water, *Pollutant identification, *Analytical techniques, Solvent extraction, *Gas chromatography, Trace elements, Water analysis, *Mass spectroscopy, Organic wastes.
Identifiers: Reagent blank interpretation, Trace organics.

Analytical quality assurance concepts are applied to the qualitative analysis of drinking water supplies for trace organics by liquid-liquid extraction and gas chromatography - mass spectrometry. Some of these concepts are also applicable to other methods of analysis. (EPA)
W76-06648

CHEMICAL/BIOLOGICAL RELATIONSHIPS RELEVANT TO ECOLOGICAL EFFECTS OF ACID RAINFALL,
National Ecological Research Lab., Corvallis, Oreg.
J. O. Reuss.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 409, $4.50 in paper copy, $2.25 in microfiche. Report EPA-660/2-75-032, June 1975. 46 p, 7 fig, 20 ref. EPA 1AAA006

Descriptors: Rainfall, Model studies, Ions, Water analysis, *Pollutant identification, Water chemistry, Soil chemistry, *Absorption, Ecology, Precipitation(Atmospheric).
Identifiers: Rainfall chemistry, *Acid rainfall, Soil acidification.

Problems of measurement and interpretation of rainfall acidity in terms of effects on the soil-plan system are discussed. The theory of the carbon dioxide-bicarbonate equilibria and its effect on rainfall acidity is given. The relationship of a cation-anion balance model of acidity in rainfall to plant nutrient uptake processes is discussed, along with its relationship to a model previously proposed in the literature. Averagre H+ concentration calculated from pH measuremets does not appear to be a satisfactory method of determining H+ loading from rainfall if the rain is not consistently acid. Calculating loading from H+ minus HCO3 -, strong acid anions minus basic cations, or net titratable acidity is suggested. The flux of H+ ions due to plant uptake processes and sulfur and nitrogen cycling is considered. H+ is produced by oxidation of reduced sulfur and nitrogen compounds mineralized during decomposition of organic matter. Plant uptake processes may result in production of either H+ or OH-ions. Fluxes of H+ from these processes are much greater than rainfall H+ inputs, complicating measurement and interpretation of rainfall effects. The soil acidifying potential due to the oxidation of the NH4+ in rainfall is apparently of a similar magnitude to the direct acidity inputs. (EPA)
W76-06650

AUTOMATIC ORGANIC MONITORING SYSTEM FOR STORM AND COMBINED SEWERS,
Raytheon Co., Portsmouth, R.I.
A. Tulumello.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 142, $5.00 in paper copy, $2.25 in microfiche. Report EPA-670/2-75-067. June 1975. 69 p, 30 fig, 6 tab, 3 append. 68-03-0262. 1BB034ROAP 21-ASO Task 038.

Descriptors: Combustion, *Instruments, Recording instruments, Carbon dioxide, *Monitoring, Sampling, *Storm water, Organic wastes, Sewage, *Pollutant identification, Combined sewers.
Identifiers: Infrared, *Total organic carbon, Organic pollution, Combined sewage, Storm-related wastewaters, *Automatic monitoring.

Early in the program to develop a stormwater TOC (total organic carbon) system, it was established that continuous on-line TOC was the best method for the measurement of stormwater pollution loading. (See W76-00507). Hardware was assembled that would process stormwater samples containing high suspended solids and that would obtain a continuous signal proportional to the concentration of TOC in the sample. Synthetic samples of municipal raw influent charged with primary sludge were analyzed using the TOC analyzer. Data were also obtained on actual stormwater samples collected during storm events at Boston. Further modifications were made after these observations. Automatic circuitry designed to provide turn auto-zero, auto-span and sample line flushing was added to the hardware, and the system was installed at Boston Cottage Farm Storage Facility. Automatic continuous analyses were obtained

ng storms on site at the Cottage Farm Storage acility. (EPA)
/76-06651

HE RATE OF SPREAD OF FUEL OIL NO. 1,
eological Survey of Sweden, Stockholm.
or primary bibliographic entry see Field 5B.
/76-06677

IONITORING GROUND-WATER QUALITY EAR A SANITARY LANDFILL,
arthview, Incorporated, Toledo, Ohio.
. R. Kunkle, and J. W. Shade.
round Water, Vol. 14, No. 1, p 11-20, January-ebruary 1976. 8 fig, 2 tab, 18 ref.

escriptors: *Water quality, *Groundwater, Landfills, *Leachate, *Monitoring, *Michigan, roundwater movement, Water pollution, Sulfur icteria, Carbonates, Chemical degradation, eduction(chemical), Oxidation-reduction potenal, Path of pollutants, Pollutants.
entifiers: *Monroe County(Mich), *Hagman oad Sanitary Landfill(Mich).

t the Hagman Road Landfill refuse is buried in custrine and glacial till deposits consisting ainly of silty clays. These clays overlie a thick rbonate aquifer used locally for water supply. ie dominant direction of groundwater flow is rtically down. Time of groundwater travel from e refuse to the aquifer was estimated at 12 years, tting first arrivals in 1978. Water quality moniring of bedrock waters showed decreases in total ssolved solids, sulfates, calcium, magnesium, lorides, and total hardness with increases in alinity to exist locally beneath the landfill. The incipal chemical reaction felt to explain some, t not all, of the water quality changes is sulfate duction. Theoretical geochemical modellings lped to support this interpretation. The landfill is hypothesized to have either triggered or acelerated sulfate reduction by creating the reducg environment. (Gibb-ISWS)
76-06684

PPLICATIONS OF AEROSPACE TECHNOLO- / IN THE PUBLIC INTEREST: POLLUTION EASUREMENT,
nver Research Inst., Colo.
r primary bibliographic entry see Field 5C.
76-06710

PHOTOCHEMICAL SIDE REACTION THAT TERFERES WITH THE PHENOL-POCHLORITE ASSAY FOR AMMONIA,
lifornia Univ., Davis. Dept. of Food Science d Technology.
Gravits, and L. Gleye.
nnology and Oceanography, Vol. 20, No. 6, p. 5-1017, 1975. 3 fig., 5 ref.

scriptors: *Analytical techniques, *Ammonia, ea water, *Light, *Chemical reactions, Spectophotometry, Assay.
ntifiers: Phenolhypochlorite assay.

posure to sunlight of the reaction mixture for phenolhypochlorite assay for ammonia in seaer results in the formation of a compound tenvely identified as indophenol, the same comnd that is formed in the presence of ammonia. photochemical side reaction of reagent blanks le with distilled water results in a yellow oration within minutes. The solution than vly turns green with continued exposure to light. After an hour of exposure the absorbance hese solutions at 640 nm is typically between and 0.3 absorbance units. Similar color changes observed when assay mixtures containing amia standards in either distilled water or seaer are exposed to sunlight. The concentration he interfering compound increases with exled exposure and its formation ceases with the solution is removed from light. The interference reaction can be prevented by wrapping the sample containers with aluminum foil before adding reagents and by assuring that the sample is not exposed to sunlight while it is being transferred to the cuvette and placed in the spectrophotometer. It is also suggested that the nitroprusside reagent and phenol solution be protected against light exposure. It is possible, too, that artificial laboratory lighting may interfere with the assay. (Auen-Wisconsin).
W76-06712

THE ACID-BUBBLING METHOD FOR PRIMARY PRODUCTIVITY MEASUREMENTS MODIFIED AND TESTED,
Iceland Univ., Reykjavik. Science Inst.
P. Theodorsson, and J. O. Bjarnason.
Limnology and Oceanography, Vol. 20, No. 6, p. 1018-1019, 1975. 5 ref.

Descriptors: *Primary productivity, *Analytical techniques, *Laboratory tests, Carbon, Carbonates, Organic matter.
Identifiers: Acid-bubbling method.

When estimating the primary productivity by separating the C14-carbonate from newly assimilated C14-labeled organic matter by acidifying the sample and driving the carbon dioxide out with a stream of air, it was found that the C14 activity of the sample containing the labeled algae seemed to decrease even after all the C14-carbonate had supposedly been driven off. A study indicated that no activity was actually being lost from the bubbling vessel, but some of the algae were sticking to the wall of the Allihn tube, which would normally lead to an underestimation of primary productivity but could, in some cases, lead to a serious overestimation. By shaking glass vials, adding 5 ml of Insta-Gel to 5 ml of seawater, and bubbling the air through a hypodermic needle, the adhesion of the C14-labeled organic matter to the walls of the vessel was eliminated. The acid-bubbling method measures not only the C14 activity of labeled organic matter inside the algae but also organic matter excreted during normal metabolism of the cells. The 5-15% of the total C14 activity in the filtrate was measured and added to the activity of the filter. (Auen-Wisconsin).
W76-06716

TELEDETECTION BY AIRPLANE AND SATELLITE IN THE STUDY OF MARINE POLLUTION, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Aubert, J. P. Breittmayer, and Tan N'Guyen.
Rev Int Oceanogr Med 39/40, p 33-52, 1975.

Descriptors: *Remote sensing, *Aerial photography, Water pollution, *Pollutant identification, Satellites(Artificial).
Identifiers: *Teledetection, Marine pollution.

The use of aircraft and satellites gives new possibilities in the studies of marine pollutions. Aerial photography facilitates exploration of restricted areas with good precision, allowing direct computation of pollutant concentration. Documents transmitted by satellites in the 500-600 and 600-700 nm wavelength show sources and extent of pollution; diffusion of the most important pollutants can be analyzed on the photos. Combined use of these 2 methods of analysis of marine water bodies allows study of peculiar local situations and their consideration in a general hydrological context.--Copyright 1975, Biological Abstracts, Inc.
W76-06717

APPARATUS FOR THE IN SITU CONCENTRATION OF TRACE METALS FROM SEAWATER,
Environmental Research Lab., Narragansett, R.I.
E. W. Davey, and A. E. Soper.
Limnology and Oceanography, Vol. 20, No. 6, p. 1019-1023, 1975. 2 fig., 6 ref.

Descriptors: *On-site tests, *Sea water, *Trace elements, *Analytical techniques, Cadmium, Chromium, Copper, Iron, Manganese, Nickel, Lead, Zinc, Heavy metals.

An instrument designed to concentrate trace metals from seawater in situ and thereby reduce some potential sources of sample contamination is described and illustrated. It is arranged to sample at 10 cm from the sediment-water interface by attaching the filter and column directly to an anchoring cement block and at 0.5 m below the air-water interface by attaching filter and column directly to a water collection bottle. Intermediate depths could also be sampled by the addition of filter, column, tubing, and bottle assemblies. The bottles are suspended from a surface float so that they remain at the same immersion depth regardless of tidal cycles. This apparatus and grab sampling give comparable trace metal results with seawater samples in the laboratory; however field measurements vary especially in embayments, which are due to metal flux changes imposed by tidal cycles, intermittent anthropogenic metal inputs, or both. This apparatus could be applied to monitoring baseline trace metal levels, sewage and industrial metal outfalls, offshore dumping sites, and diffusion of heavy metals from polluted sediments. It could be adapted for monitoring other compounds such as methylated mercury, chlorinated hydrocarbons, amino acids, etc., by replacing the Chelex-100 in the columns with resins specific for the compound of interest. (Auen-Wisconsin)
W76-06721

A PISTON CORER FOR PEAT,
Woods Hole Oceanographic Institution, Mass.
A. C. Redfield.
Limnology and Oceanography, Vol. 20, No. 6, p. 1042-1045, 1975. 3 fig., 4 ref.

Descriptors: *Sampling, *Muck soils, Peat, Cores, Lake sediments, Muds.
Identifiers: Piston corer.

An instrument is described which secures samples of peat or other soft sediments with minimal disturbance of structure, compression, or contamination by material from other depths. Its special virtue is the automatic control of the depth of sampling. It has been used to sample salt marsh peat from depths up to 25 ft, and by working through a hole in ice cover, 19 ft of soft lake sediments have been secured from under 27 ft of water. The construction and operation of the corer is diagrammed. The first core, extending from the surface to a 1 ft depth is cut by inserting the handle in the upper hole of the template to ensure that the piston remains immovable and forcing the core barrel downward to the limit of its excursion, when the upper end of the extension tube will correspond in position to the second hole of the template. The instrument is then withdrawn after tightening a setscrew. A second core, from 1 to 2 ft below the surface, is obtained after reinserting the corer into the hole; the process is repeated until five cores are obtained and may be continued to greater depths by the attachment of extension rods and tubes. Cores can be secured from any predetermined depth. Two instruments have been made to obtain cores of different diameter. Their construction and dimensions are shown. (Auen-Wisconsin)
W76-06724

STUDY OF THE GENUS VIBRIO IN DRINKING WATER, (IN SPANISH),
Instituto Bacteriologico de Chile, Santiago.
For primary bibliographic entry see Field 5C.
W76-06731

STUDY OF THE STRONTIUM 90/STRONTIUM ISOTOPE BALANCE IN A LATVIAN LAKE, (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.

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M. P. Leinerte, D. R. Vadzis, Z. K. Kalninya, and Y. Y. Sloka.
Ekologiya 5(5), p 77-79, 1974.

Descriptors: Lake, Strontium radiosotopes, Mud, Radioisotopes, Plankton, Seasonal, Spectrophotometry, Radioactivity, Pollutant identification, Aquatic plants.
Identifiers: Alburnus-Alburnus, Elodea-Canadensis, Equisetum-Limosum, Esox-Lucius, Nuphar-Luteum, Perca-Fluviatilis, Phragmites-Communis, Strontium-90, Typha-Latifolia, *USSR(Latvia), *Isotope balance(Lakes).

To study the isotope balance of the lake, the stable Sr level was determined by atomic absorption spectrophotometry and the Sr90 level was determined the oxalate Y90 separation techniques in Lake Engures of the Latvian SSR (USSR). Seasonal variations in these levels are observed. The higher the stable Sr level, the higher was the radioactive Sr in the water, plants and fish. Toward the end of the vegetation period, the levels of both isotopes increased in the lake water and plants, decreased in plankton, mud, and ichthyophagous fish and did not change in the sand or planktonophagous fish. The plants studies included Equisetum limosum, Phragmites communis, Typha latifolia, Nuphar luteum and Elodea canadensis. The fish studies were Alburnus alburnus, Perca fluviatilis and Esox lucius. The complete mexture of Sr and Sr90 had not yet occurred in this lake.--Copyright 1975, Biological Abstracts, Inc.
W76-06733

ON THE UNIVERSALITY OF THE POOLE AND ATKINS SECCHI DISK-LIGHT EXTINCTION EQUATION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Gilbert, and R. Gene.
J Appl Ecol. 11(1), p 399-401, 1974.

Descriptors: Ponds, Sewage, *Arizona, *Secchi disks, Equations, *Light penetration, Measurement.
Identifiers: *Light extinction equation, *Poole and Atkins equation.

On 26 clear days during the year April 1971-March 1972, K(extinction coefficient) and ZSD (Secchi disk depth) measurements were made in a small manmade pond filled with renovated sewage water of the Flushing Meadows reclamation project at Phoenix, Arizona. The results of the determinations of K, and ZSD at Flushing Meadows are plotted on a log-log scale, along with additional data. The Poole and Atkins equation possesses a universality that should provide a sufficiently accurate estimate of light extinction in all types of water for many biological studies lacking detailed light profile measurements.--Copyright 1975, Biological Abstracts, Inc.
W76-06737

THERMODYNAMIC LIMITATIONS ON THE USE OF THE PLATINUM ELECTRODE IN EH MEASUREMENTS,
M. Whitfield.
Limnol Oceanogr. 19(5), p 857-865, 1974.

Descriptors: *Thermodynamics, Estuaries, Electrodes, Hydrogen ion concentration, Oxygen, Measurement, *Estuarine environment, Oceans, *Oxidation - reduction potential, *Pollutant identification.
Identifiers: Plantinum electrodes.

The thermodynamic stability of surface oxide and sulfide coatings on the Pt electrode is considered. In well mixed environments thermodynamic considerations and experimental evidence suggest that the platinum surface acts as an oxide electrode that responds to pH rather than to O2 partial pressure. In stagnant conditions in the marine or estuarine environment the slow formation of Pt sulfide may push the measured Eh values to more negative potentials if permanently emplaced electrodes are used. These reactions may restrict the operational use of Eh measurements.--Copyright 1975, Biological Abstracts, Inc.
W76-06738

DETERMINATION OF PARTS PER BILLION SULFIDE IN WATER WITH THE SULFIDE-SELECTIVE ELECTRODE,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
E. W. Baumann.
Anal Chem. 46(9), p 1345-1347. Illus. 1974.

Descriptors: *Pollutant identification, *Electrodes, *Sulfides, Water analysis, Analytical techniques, Methodology.

The sulfide-selective electrode is well suited for the routine determination of total sulfide in water because of simplicity of measurement and absence of interferences. A procedure issued by Orion, with a sulfide antioxidant buffer of sodium salicylate ascorbic acid and sodium hydroxide, will determine sulfide contents as low as 0.1 ppm. This sensitivity was extended to 30 ppb by removal of heavy metals (identified as Cu and Cr) from the sodium salicylate by dithizone extraction. Because this sensitivity was still inadequate to determine sulfide concentrations in natural waters, a preconcentration step was incorporated to extend the determination to a lower ppb range. The sulfide was separated as ZnS, coprecipitated with Zn(OH)2, and subsequently dissolved in alkaline EDTA-ascorbic acid solution for potentiometric measurement with the sulfide-selective electrode. The procedure without the preconcentration step was used to determine higher concentrations of sulfide. --Copyright 1975, Biological Abstracts, Inc.
W76-06744

NEUTRON ACTIVATION ANALYSIS OF SOME OF THE BIOLOGICALLY ACTIVE TRACE ELEMENTS IN FISH,
Pennsylvania State Univ., University Park, Dept. of Nuclear Engineering.
K. K. S. Pillay, C. C. Thomas, Jr., and C. M. Hyche.
J Radioanal Chem. 20(2), p 597-606, 1974.

Descriptors: *Pollutant identification, *Trace elements, *Neutron activation analysis, *Lake Erie, Analytical techniques, Fish, Copper, Mercury, Cadmuim, Zinc, Chromium, Spectrometry.
Identifiers: Arsenic, Selenium.

Highly specific neutron activation analysis procedures involving post irradiation chemical separations were developed for the determination of (environmental pollutants) Cu, Hg, Zn, Cd, As, Se and Cr in fish tissues. The procedures developed were used to determine the levels of these biologically active elements in some of the commercially important fish species of Lake Erie. The nuclear analytical procedures developed generally involved the irradiation of fish tissues followed by wet-ashing in the presence of non-radioactive carriers. From the homogeneous solution of the tissue digest, the elements of interest were chemically isolated and the radioactivities were measured by scintillation gamma ray spectrometry. The results include both the determination of the precision and accuracies of each of these elemental analyses and a survey of these 7 elements in 9 major fish species of Lake Erie.--Copyright 1975, Biological Abstracts, Inc.
W76-06753

CHLOROPHYLL A CONTENT AS AN INDEX OF PERIPHYTON PRODUCTIVITY, EXEMPLIFIED BY LAKE KRASNOE, (IN RUSSIAN),
S. L. Basova.
Ekologiya 5(2), p 73-74, 1974.

Descriptors: *Chlorophyll, *Periphyton, Lakes, *Productivity, Biomass, Bioindicators, Ponds, Pollutant identification, Reeds, Seasonal.
Identifiers: Bulrush, Grass, *USSR(Lake Krasnoe).

Samples of periphyton were collected in the summer and fall of 1971 in Lake Krasnoe (Karelian isthmus (Russian SFSR, USSR). The periphyton biomass on different substrates was established and the content of chlorophyll a was determined spectrophotometrically. When considering chlorophyll a as an index of biomass it is important to know its relative content in Periphyton. It varied from 0.02-0.24% of fresh weight for periphyton of reedgrass, 0.10-0.33% for pondweed, 0.09-0.18% for bulrush and 0.02-0.56% for stones. On the assumption that the biomass expressed on a fresh weight basis is 10 times greater than the dry weight, the average relative content of chlorophyll in the periphyton of Lake Krasnoe is 1,2-1.7% of the dry weight of the periphyton.--Copyright 1975, Biological Abstracts, Inc.
W76-06772

THE DETERMINATION OF CARBOHYDRATES IN NATURAL WATERS: A COMPARISON OF PAPER CHROMATOGRAPHIC: COLORIMETRIC AND ENZYMATIC METHODS, (IN GERMAN),
Freiburg Univ. (West Germany). Limnologische Institut.
A. Geller.
Arch Hydrobiol Supplementb 47(3), p 295-324, 1975.

Descriptors: *Carbohydrates, *Chromatography, *Colorimetry, Enzymes, Analytical techniques, Assay, Pollutant identification.
Identifiers: Aphanizomenon, *Enzymatic method, Paper chromatography, Saccharide, Spaerotilus.

In limnology and oceanography estimation of carbohydrates is mainly done by paper chromagraph and colorimetric tests, e.g., the anthrone metho for determination of total hexoses. Paper chromatographic and colorimetric methods usually employed in limnology and other paper chromatographic, colorimetric and enzymatic assays were investigated and compared for sensitivity, specificity and applicability to carbohydrate analysis of natural waters. The carbohydrate content of Aphanizonmenon and Sphaerotilus were determined after acid hydrolysis as monosaccharide by these methods.--Copyright 1975, Biological Abstracts, Inc.
W76-06773

THE HEAVY METAL CONCENTRATIONS IN THE MARINE SEDIMENTS ALONG THE COAST OF FUKUYAMA, (IN JAPANESE),
Kagoshima Univ. (Japan). Marine Biology Lab and Kagoshima Univ. (Japan). Environment Sciences.
A. Inoue, and S. Asakawa.
Mem Fac Fish Kogoshima Univ 23, p 209-21 1974.

Descriptors: *Heavy metals, Coasts, *Sediment, Spectrophotometry, Pollutant identification.
Identifiers: Eutreptiella-sp, Exuviaella-sp, Heavy, *Japan(Fukuyama).

The heavy metal contents in the marine sedimen (Japan) were evaluated by atomic absorption spectrophotometry. The heavy metals ordinarily included 2400-3100 microgram/g of dried matter Fe, 280-790 for Mn, 8-21 for Co, 13-100 for Cu, 700 for Zn, 16-95 for Ni and 1.0-3.9 for Cd. definite difference was recognized for any met between the contents of the upper layer (0-5 from the surface) and those of lower layer (10 cm). The mean quantities of extractable hea metals in the marine sediments of this distr were: 2000 microgram/g of Fe/g of dried mat 280 of Mn, 6 of Co, 20 of Cu, 90 of Zn, 6 of Ni

of Cd. High concentration of extractable Fe and Mn suggested that the elution of those metals from marine sediments would constantly occur and maintain the long lasting blooms of dinoflagellates, such as Exuviaella sp. and Eutreptiella sp.--Copyright 1975, Biological Abstracts, Inc.
W76-06774

5B. Sources Of Pollution

APPLICATIONS OF LINEAR TIME SERIES MODELS AND STEPWISE REGRESSION MODELS TO SELECTED WATER QUALITY DATA ON THE CONNECTICUT RIVER,
Massachusetts Univ., Amherst. School of Health Sciences.
C. J. Gross, and R. C. Galkiewicz.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-251 557 $5.00 in paper copy, $2.25 in microfiche. Massachusetts Water Resources Research Center, Publication No. 37, November, 1973. Completion Report FY 74-4, 36 p, 2 fig, 15 tab, 6 ref, append. OWRT A-062-MASS(1).

Descriptors: *Time series analysis, *Regression analysis, *Model studies, *Connecticut River, Data collections, *Dissolved oxygen, *Coliforms, Forecasting, Estimating, Water pollution sources, Computer programs.
Identifiers: Autoregressive models, ARMA models, White noise models.

Each water quality data set for the Connecticut River is fitted by a linear time series model, undergoes a stepwise multiple regression, and has its residuals fitted by a linear time series model. All data sets including both original and residual data sets are fitted adequately by either an autoregressive model, an ARMA model, or a white noise model. Using these data sets it was possible to forecast future dissolved oxygen readings assuming conditions of continuity in the basin) at three sampling stations, as well as forecasting future coliform counts at two of these stations. The analyses show that all original data sets for which the white noise model is inappropriate are proportion saturated dissolved oxygen data sets. Furthermore, the tendency of proportion saturated dissolved oxygen appears downward in some years, e.g. 1962, but not always, e.g. 1963. An analysis of coliform counts could not be made because both original coliform data sets were fitted adequately by the white noise model. The pollution related independent variables which are most highly related to dissolved oxygen levels are pH and turbidity, though no strong relationship can be demonstrated.
W76-06157

SALINITIES OF AMBIENT AND INTERSTITIAL WATERS OF SOME MASSACHUSETTS NORTH SHORE SALT-MARSHES,
Massachusetts Univ., Amherst.
D. L. Merrow, and N. H. Nickerson.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-251 551 $3.50 in paper copy, $2.25 in microfiche. Completion Report, April 1975, 7 p, 10 ref. OWRT A-036-MASS(1).

Descriptors: *Salinity, *Groundwater movement, *Massachusetts, *Salt marshes, *Peat, Chlorides, Hydrogen sulfide, Gases, Test wells, Water pollution sources, Path of pollutants, Connate water, Pollutant identification.

The purpose was to determine whether selected salt marshes along the north shore of Massachusetts had any effect on retarding seaward flow of fresh ground water. The salt marshes on the North Shore are underlain mostly by loose black peat smelling strongly of H2S; below the peat at different depths is found dense Boston Blue clay. Both these soils are semipervious to impervious to water. Water samples from holes drilled in the marsh showed much variation in chloride content. The evidence indicated that ground water is slowed and to a measurable extent physically backed up by peat deposits in marshes over heavy clay as are found on the North Shore. These findings may be interpreted as evidence that where an impermeable or hard-pan layer occurs under a salt marsh, fresh ground-waters move seaward through the peats of the marsh only slowly, and that any natural openings such as cracks or man-made openings such as mosquito control ditches hasten this run-off. Slow water movement through the peat is amply demonstrated by the presence of H2S in unmistakable quantity; the anaerobic condition marked by the presence of this gas means no rapid penetration of oxygenated waters.
W76-06158

NITROGEN, PHOSPHORUS AND CARBON FLUX IN CHESAPEAKE BAY MARSHES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W76-06162

REGIONAL DISTRIBUTION OF THE MAJOR DISSOLVED SOLIDS IN THE STREAMS OF ILLINOIS,
Northern Illinois Univ., De Kalb. Dept. of Geology.
M. M. Nienkerk, and R. C. Flemal.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 554, $4.50 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 109, February 1976. 56 p, 34 fig, 4 tab, 21 ref, 3 append. S-046-ILL.

Descriptors: *Dissolved solids, *Illinois, Streams, *Water analysis, *Distribution, *Regional analysis, *Path of pollutants, *Distribution patterns, *Water pollution sources, Strip mining, Wastes, Waste disposal, *Chemical wastes, Drainage basins.
Identifiers: *Stream water quality.

Using water analyses from 67 gaged streams in Illinois, the frequency-weighted mean concentration (mg/l) and the long-term yield (tons/sq mi/yr) were determined for the following dissolved constituents: iron, manganese, fluoride, boron, silica, phosphate, chloride, sulfate, nitrate, ammonium, calcium, magnesium, sodium, potassium, strontium, carbonate, alkalinity, total hardness, and total dissolved mineral content. Values obtained were used to construct contour maps of the magnitudes of each constituent. Most of the constituents are readily contoured, indicating that their magnitudes have regional consistencies, and are controlled by regional rather than local factors. Several constituents (phosphate, ammonium, potassium, and strontium) do not follow this pattern, and at least two (chloride and nitrate) have increased in magnitude with time. Constituents with strong regional patterns can be divided into groups based on the geographic location of high and low concentration/yield areas. In most cases explanations for the patterns can be found in regional patterns of geologic, hydrologic, and/or demographic conditions. Detailed and specific sources for individual constituents are difficult to delimit at this level of investigation. However, general considerations as to the relative importance of natural versus anthropogenic sources can be hypothesized in some of the more apparent cases. Among significant anthropogenic sources appear to be strip mining activity, introduction into--and subsequent fallout from--the atmosphere of soluble materials, use of fertilizers, disposal of industrial, domestic, and farm wastes, and street salting.
W76-06163

INFILTRATION OF ORGANIC PHOSPHATE COMPOUNDS IN SOIL,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
D. E. Rolston, R. S. Rauschkolb, and D. L. Hoffman.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1089-1094, November-December 1975. 6 fig, 19 ref.

Descriptors: *Infiltration, *Irrigation practices, *Soil types, *Fertilizers, *Phosphorus compounds, Leachate, Groundwater movement, Penetration, Soil properties, Phosphates, Nutrient removal, Phosphorus, Soil analysis, Evaluation, Soil chemistry, Soil bacteria, Soil moisture, Soil water, Organic compounds, Clay loam.
Identifiers: Organic phosphate compounds, Chemical fertilizers, Phosphorus placement, *Phosphorus fertilizers, Phosphatase enzyme, Panoche clay loam, Aiken clay loam, Glycerophosphate, Methyl ester phosphate, Glycol phosphate, Infiltrating solutions.

Organic phosphate compounds may be moved greater distances into soil than is possible with inorganic phosphates, inasmuch as organic phosphates must be enzymatically hydrolyzed to orthophosphate before soil reactions inhibit movement. The hydrolysis in solution and movement in soil of six organic phosphates were investigated in order to evaluate possible advantages of the compounds as fertilizers. The compounds studied were glycerophosphate, methyl ester phosphate, glycol phosphate, glycol phosphate, ethyl ester phosphate, glucose 1-phosphate, and glucose 6-phosphate. The infiltration of organic P compounds into Panoche clay loam soil and glycerophosphate into five soils differing in texture, clay type, organic matter, and pH and into one soil at three water contents was investigated by infiltrating organic P solution into columns of dry or moist soil at a rate of 66 kg of P/ha. Inorganic P concentration in bicarbonate extracts was measured as a function of soil depth at the termination of infiltration. The movement of P from organic compounds was compared with the movement of potassium phosphate. All the organic phosphates hydrolyzed at similar rates. The P from all the organic compounds moved to approximately the 12-cm depth in the calcareous Panoche clay loam soil with only slight differences in P concentration above that depth, whereas inorganic phosphate moved no more than 2-3 cm. The enzymatic hydrolysis rate of glycerophosphate and the resulting P distribution after infiltration was influenced by soil type. (Henley - ISWS)
W76-06170

LATERAL LOSS OF PICLORAM AND 2,4-D FROM A FOREST PODSOL DURING RAINSTORMS,
Guelph Univ. (Ontario). Dept. of Botany and Genetics.
R. Suffling, D. W. Smith, and G. Sirons.
Weed Res. Vol 14, No. 5, p 301-304. 1974. Illus.

Descriptors: *2-4-D, Podsols, Rain, Great Lakes, Forests, Canada, Herbicides, Clear-cutting.
Identifiers: *Picloram.

Losses of picloram (4-amino-3,5,6-trichloropicolinic acid as the triisopropanolamine salt) and 2,4-D (as the triisopropanolamine salt) from a Tordon 101-sprayed podsol in a Great Lakes (Canada) forest clearcut were measured for 1 yr following spraying. Less than 1.0% of the picloram and much less than 0.1% of the 2,4-D applied was lost during 7 runoff events. Even an event less than 24 h after spraying failed to release significant quantities of either herbicide.--Copyright 1975, Biological Abstracts, Inc.
W76-06197

FORMULATION AND USE OF PRACTICAL MODELS FOR RIVER QUALITY ASSESSMENT,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 5G.
W76-06209

A COMPARATIVE STUDY OF CHEMICAL LOADINGS OF ACID AND NON-ACID TRIBUTARIES OF CHEAT LAKE, WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Biology.
D. Edens.
Proceedings West Virginia Academy of Science, Vol. 1, p. 45-51, 1974. 4 tab., 14 ref.

Descriptors: *Chemical analysis, *Acid mine drainage, *Acid streams, *West Virginia, Discharge measurement, Hydrogen ion concentration, Specific conductivity, Silicates, Sulfates, Iron, Acidity, Phosphates, Nitrates, Nitrogen, Ions, Cations, Potassium, Surveys, Tributaries.
Identifiers: *Cheat Lake(W Va), Canyon Run(W Va), Sunnyside Run(W Va), Tower Run(W Va), Maple Run(W Va), Morgan Run(W Va), Cole's Run(W Va), Quarry Run(W Va), Rubles Run(W Va).

Acid stream loading was compared with non-acid stream loading in tributaries of Cheat Lake, West Virginia, using concentration and discharge measurements taken during June 1973-January 1974. Acid streams had low pH, high conductivity, high silicate, sulfate, total iron, total acidity, orthophosphate, and total phosphate concentrations, and low nitrate-nitrogen concentrations. Non-acid streams had a pH near neutrality, lower conductivity, and lower silicate, sulfate, total iron, total acidity, orthophosphate, and total phosphate concentrations. Acid streams had high loadings of sulfate, total iron, total acidity, orthophosphate, and total phosphate, lower nitrate-nitrogen loading, and contributed more ions to Cheat Lake. Acid mine drainage did not increase silicate loading. Streams receiving acid drainage had higher cation concentrations, except potassium, and greater ion concentrations and loadings per unit drainage area. Acid tributaries could be distinguished from non-acid tributaries by all parameters studied except nitrate-nitrogen concentration and loading, silicate loading, and potassium concentration. Maple Run and Quarry Run had been disturbed and were distinguished from other non-acid streams by drainage area concentrations and loadings. Loadings and concentrations per unit drainage area detect small differences in streams and may indicate disturbances in drainage basins undetected by concentrations or loadings alone. (Buchanan-Davidson--Wisconsin).
W76-06213

ECOLOGY AND BIOGEOGRAPHY OF MAYFLIES (EPHEMEROPTERA) OF RUNNING WATERS IN THE POLISH PART OF THE CARPATHIANS. 1. DISTRIBUTION AND QUANTITATIVE ANALYSIS,
Jagellonian Univ., Krakow (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W76-06216

BIODETERIORATION OF NAVY INSECTICIDES IN THE OCEAN,
Civil Engineering Lab. (Navy). Port Hueneme, Calif.
H. P. Vind, and C. W. Mathews.
Available from the National Technical Information Service, Springfield, Va. 22161 as AD/A007 568 $3.50 in paper copy, $2.25 in microfiche. ONR Annual Report No. 4, January 1975. 13 p, 2 tab., 1 ref. ONR 1-0020.

Descriptors: *Biodegradation, *Insecticides, *Sea water, DDT, Chlorinated hydrocarbon pesticides, Microorganisms, Lepids, Solubility, Pesticide residues, Toxicity, Leaching, Laboratory tests, Water pollution control.
Identifiers: Limnoria tripunctata.

Based on previous studies concerning the biodeterioration of insecticides in the ocean, it was hypothesized that water insoluble chlorinated insecticides are transported in sea water primarily by being absorbed in the fatty cell membranes of microorganisms suspended in the water. According to the hypothesis, it is theorized that insecticides which are somewhat less fat soluble than DDT will not enter marine food chains as easily at DDT. Thus they would be less hazardous as DDT, but would be just as toxic and persistent. It is predicted that insecticides in sewage can be removed with microbial cells in a primary or secondary sewage treatment plant. To determine the validity of this hypothesis, matchsticks are impregnated with a chlorinated hydrocarbon insecticide or other chlornated compound, then tested to see if the chlorine-containing compounds are degraded or leached. The wood eating marine crustacean, Limnoria tripunctata, is used as the test organism. Also gas chromatography will be used to determine the presence of insecticides. Early tests have been inconclusive, because leaching is very slow. Relative rates of biodegradation, fat solubilities, and leaching of 26 different chlorinated organic insectides or related chlorinated compounds are being tested. (Buchanan-Davidson--Wisconsin)
W76-06219

EFFECT OF PHOSPHORUS AND SULPHURSPHATES ON MOVEMENT OF PHOSPHORUS AND SULPHUR IN TWO SOILS,
New Zealand Fertilizer Manufacturers Research Association, Inc., Papatoetoe.
For primary bibliographic entry see Field 2G.
W76-06242

VIBRIO PARAHAEMOLYTICUS IN SEAWATER OFF THE PACIFIC COAST OF PANAMA,
Gorgas Memorial Lab., Balboa Heights, Canal Zone.
For primary bibliographic entry see Field 2L.
W76-06252

N AND P DISTRIBUTION IN LAKE KINNERET (ISRAEL) WITH EMPHASIS ON DISSOLVED ORGANIC NITROGEN,
Israel Oceanographic and Limnological Research Ltd., Haifa; and Kinneret Limnology Lab., Tiberias (Israel).
C. Serruya, U. Pollingher, and M. Gophen.
Oikos, Vol. 26, No. 1, p 1-8, 1975. 7 fig, 4 tab, 26 ref.

Descriptors: *Nitrogen, *Phosphorus, *Nitrogen cycle, *Lake sediments, *Lake stages, Lakes, Ammonia, Nitrates, Denitrigication, Ammonification, Nitrogen compounds, Bottom sediments, Eutrophication, Limnology, Plankton, Anaerobic conditions.
Identifiers: *Dissolved organic nitrogen, *Lake Kinneret(Israel), Peridinium.

Fluctuations of the amounts of different forms of nitrogen and total phosphorus, and their distribution between lake water and plankton in Lake Kinneret in northern Israel are described. Distribution of N and P shows that the lake water is the largest pool of N while sediments are the main reservoir of P. The organic nitrogen originates from 3 sources: the watershed, the plankton and the sediments. During the 7-8 month anoxic period, a large amount of organic nitrogen is accumulated in the lake bottom. During the destratification and turnover period this deposited organic nitrogen undergoes rapid hydrolysis and causes a sudden increase in dissolved organic nitrogen. The rate of ammonification of the dissolved organic nitrogen in winter may have an important ecological role, as a delay may retard the Peridinium bloom. (Robinett-Arizona)
W76-06268

DEVELOPMENT OF AN ECONOMIC/ENVIRONMENTAL PLAN FOR DENTS RUN WATERSHED, WEST VIRGINIA.
Halliburton Services, Duncan, Okla.
For primary bibliographic entry see Field 5G.
W76-06270

HORIZONTAL SPREAD OF WASTEWATER FIELD OVER CALM OCEAN SURFACE,
Montgomery (James M.), Pasadena, Calif.
J. L. Chao.
Journal Water Pollution Control Federation, Vol. 47, No. 10, p 2504-2510, October, 1975. 2 fig, 18 ref.

Descriptors: *Waste assimilative capacity, *Waste water disposal, *Oceans, *Effluents, Design criteria, Engineering, Water pollution effects, Pollutant identification, Flow characteristics, *Path of pollutants.

Discharge of waste water into the ocean by cities and industries demands effective dilution of the effluent for oxidation and assimilation of the waste. Because of the complexity of ocean outfall system designs, the problem of horizontal spread of waste water in the absence of ocean currents was analyzed, and design guidelines were established for the praticing engineer. Since the primary purpose of the paper was to provide a simple method for estimating the dilution resulting from horizontal spread, flow characteristics were simplified and assumptions were made. It was pointed out that the subsequent dilution resulting from horizontal spread is relatively low in magnitude in comparison with the initial dilution that the effluent buoyant plume receives. (Loustau-FIRL)
W76-06294

CHLORINATION IN DILUTE AQUEOUS SYSTEMS; 2,4,6-TRICHLOROPHENOL,
Waterloo Univ. (Ontario). Dept. of Chemistry.
J. G. Smith, S. Lee, and A. Netzer.
Environmental Letters, Vol. 10, No. 1, p 47-52, 1975. 1 tab. 10 ref.

Descriptors: *Chlorination, *Chemical reaction, *Phenols, Analytical techniques, Pollutant identification, Water pollution sources.
Identifiers: Chloroform.

In order to elucidate the effects of chloroform on phenols, 2,4,6-trichlorophenol in dilute aqueous solution was treated with hypochlorous acid at pH 3.5 to pH 6. Reaction products were extracted from solution and examined by thin layer chromatography. The individual isolated components were characterized by their infra-red, nmr, and mass spectra. The principal products of the reaction were 2,4,4,6-tetrachloro-2,5-cyclohexadienone (A), and 2,6-dichloro-p-benzoquinone (B). Their identification was based on their spectra and was confirmed by mixture melting point with authentic samples. The possibility of the interconversion of A and B was investigated by treating each of these compounds with hypochlorous acid but it did not occur. Instead, an unindentified material characterized by a carbonyl frequency of 1800 c/m was formed. A number of minor products were also formed. The material balance in the experiments was low, with approximately 50% of the organic material remaining in the aqueous layer being lost by volatilization. Recovery of the organic products from the chromatographic column was also low. In part, this loss appears due to photolytically induced decomposition of the chlorinated products. Hypochlorous acid produced non-phenolic products by oxidation and by the addition of chlorine and/or hypochlorous acid to the aromatic ring. Although the toxicological properties of these polychlorinated species are unknown, chemical separations of chlorination reaction products should be employed with caution. (Loustau-FIRL)
W76-06306

PHOSPHATE SORPTION CHARACTERISTICS OF SOILS TREATED WITH DOMESTIC WASTE WATER,
Connecticut Agricultural Experiment Station, New Haven.
B. L. Sawhney, and D. E. Hill.
Journal of Environmental Quality, Vol. 4, No. 3, p 342-346, July/September, 1975. 5 fig, 4 tab, 14 ref.

Descriptors: *Nutrient removal, *Soils, *Phosphates, *Sorption, Laboratory tests, Septic tanks, Soil mechanics, Waste water treatment, Environmental effects.
Identifiers: Soil saturation.

The capabilities of six widely different Connecticut soils to sorb phosphate was studied in laboratory tests. Samples of the soils were suspended in phosphate solutions and their saturation times were measured. With that information the traveling time of the phosphate in the soils was calculated. Soil cores of the six soils were then leached with phosphate solutions on a weekly basis for two years. It was found that because of the great variance in sorption capacities, the saturation time requirements varied greatly. Over time the soils did not become fully saturated, suggesting that the soils were regenerated. These observations were substantiated by field studies around septic tank drainfields, one of which had been in operation for 5 years and still showed sorption capabilities. In addition, treatment of acid oils with waste water was found to increase their pH, thereby increasing their CEC and capacity to remove cationic pollutants from waste water. Thus it was concluded that soils around septic tank systems can remove phosphate effectively and for an indefinite length of time. (Loustau-FIRL)
W76-06330

EFFECT OF SEWAGE SLUDGE ON SOME SOIL PHYSICAL PROPERTIES,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5E.
W76-06331

TRACE ELEMENT CONCENTRATIONS OF SEWAGE TREATMENT PLANT EFFLUENTS AND SLUDGES; THEIR INTERACTIONS WITH SOILS AND UPTAKE BY PLANTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
A. R. Bradford, A. L. Page, L. J. Lund, and W. Olmstead.
Journal of Environmental Quality, Vol. 4, No. 1, p 123-217, January/March, 1975. 1 fig, 8 tab, 18 ref.

Descriptors: *Sludge disposal, *Trace elements, *Soil contamination effects, Treatment facilities, Effluents, California soil analysis, Toxicity, Water pollution effects, Waste water(Pollution).
Identifiers: Sludge toxicity.

The variety and concentrations of trace elements in effluents and sludges from certain metropolitan areas were identified and their interactions with soils and effects on plant growth were evaluated. Seven secondary treatment plants in southern California were selected for bimonthly analyses of the effluent over a 10-month period. The concentrations of Cu, Zn, Ni, Co, and Cd were consistently higher in the sludge samples than those obtained in ordinary California soils. Analysis of barley, bean, and tomato plants grown in sand culture and irrigated with aqueous sludge extracts was done to demonstrate the variabilty of absorption of different elements from sludge sources. Excessive and often toxic concentrations of B, Cu, Mo, Ni, Co, and Cd were found when compared to the concentrations in the control plants irrigated with a complete nutrient solution. Variabilities of different elements from different sludge are presented in a table. (Loustau-FIRL)
W76-06332

REVIEW OF HEATED DISCHARGE MANAGEMENT AND CONTROL ALTERNATIVES, ONCE-THROUGH SYSTEMS IN LARGE WATER BODIES.
Maclaren (James F.) Ltd., Willowdale (Ontario).
Environmental Protection Service, Environment Canada, Ottawa, Canada, Economic and Technical Review Report EPS 3-WP-75-4, December 1975, 161 p., 14 fig, 12 tab, 214 ref.

Descriptors: *Thermal powerplants, *Temperature control, Powerplants, Intakes, Environmental effects, *Reviews, *Thermal pollution.
Identifiers: *Heated discharges, Cooling systems.

A review is presented of current literature and non-Canadian legislation dealing with heated discharges from thermal power plants. Management and control alternatives are discussed, with particular reference to the problems associated with once-through cooling systems discharging into large water bodies. Topics discussed include the environmental effects of cooling systems, alternative designs for intakes and cooling systems, methods for the prediction and monitoring of environmental effects of heated discharges, and research needs. Past and existing standards and regulations for temperature control in other countries are critically reviewed. Recommendations are made concerning the selection of power plant sites, pre-operational surveys, the development of criteria for heated discharge regulation, intake and outfall design, and alternative cooling systems. (Environment Canada)
W76-06372

A MODEL TO PREDICT THE PERFORMANCE OF FEEDLOT RUNOFF CONTROL FACILITIES AT SPECIFIC OREGON LOCATIONS,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
R. B. Wensink, and J. R. Miner.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 6, p 1141-1146, November-December 1975. 3 fig, 6 tab, 6 ref. OWRT A-028-ORE(Z) EPA R-803819-01-0.

Descriptors: *Model studies, *Storm runoff, *Agricultural runoff, *Weather data, *Farm wastes, *Oregon, Water pollution sources, *Feed lots, Detention reservoirs, Water pollution control, Organic wastes, Rainfall-runoff relationships, Precipitation(Atmospheric).
Identifiers: Runoff curve number, Sufficient design method.

A computer simulation model was developed which can be used to size feedlot runoff retention basins based upon previous climatological records. The model simulated a feedlot surface onto which precipitation falls and runoff results. Weather data from three unique climatological regions were used in the model to evaluate feedlot pollution control designs in Oregon. The sufficient design method was used to determine minimum storage volume required to prevent illegal discharges as defined by EPA Effluent Guidelines. This technique demonstrated that to use design procedures based upon a factor times the 10 yr-24 hr or the 25 yr-24 hr storm leads to designs that are either unreasonably expensive or would lead to illegal discharges. The model was used to determine pollution control performance with various combinations of pumping rates and storage facility volumes. (Lardner - ISWS)
W76-06382

WASTEWATER DISPOSAL BY SUBMERGED MANIFOLDS,
Miljoplan, Hovik (Norway). Water Pollution Section.
P. Liseth.
Journal of Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY1, Proceedings Paper 11839, p 1-14, January 1976. 8 fig, 13 ref, 1 append.

Descriptors: *Path of pollutants, *Hydraulic design, *Hydraulic models, *Hydraulic structures, *Outlet works, Outlets, Outfall sewers, Diffusion, Waste dilution, Discharge(Water), Orifices, Hydraulics, *Waste water disposal, Laboratory tests, Mixing.
Identifiers: Manifolds, *Submerged orifices, Diffusors, Submerged manifold.

Jet mixing from submerged manifolds for wastewater disposal was studied by means of hydraulic model experiments. The experimental results showed that the dilution and flow pattern of buoyant jets from a manifold in stagnant receiving water of uniform density is altered if merging of the jets takes place. The ratio between vertical distance y above the manifold to the distance L between the ports along the manifold was found to be determining for the effects of merging. For values of y/L between 0-5, no significant differences in the center dilution was observed as compared to that of a single jet. For y/L greater than 5, the jets gradually merged into a two-dimensional plume over the manifold, causing a rapid reduction in the center dilution. For a given discharge load per length of manifold a port spacing y/L from 5 to 10 will result in the highest center dilution of the jets. (Morris-ISWS)
W76-06387

THE SALINITY EFFECT IN A MIXED LAYER OCEAN MODEL,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 2L.
W76-06393

NITRATE MOVEMENT AND ITS DISTRIBUTION IN THE SOIL PROFILE OF DIFFERENTIALLY FERTILIZED CORN WATERSHEDS,
Agricultural Research Service, Cheyenne, Wyo.
G. E. Schuman, T. M. McCalla, K. E. Saxton, and H. T. Knox.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1192-1197, November-December 1975. 4 fig, 2 tab, 20 ref.

Descriptors: *Nitrates, *Fertilizers, *Soil profiles, *Soil water movement, *Ion transport, *Iowa, Analytical techniques, Inorganic compounds, Leaching, Nutrient removal, Water pollution sources, Path of pollutants, Water quality, Nitrogen, Soil analysis, Irrigation effects, Soil tests, Percolation, Groundwater, Root zone, Agriculture, Loess, Contour farming, Corn(Field), Agricultural watersheds.
Identifiers: Nitrate movement, Chemical fertilizers, Anhydrous ammonia, Ammonia nitrate.

Nitrate movement within the 6.1-m soil profile of a watershed in southwestern Iowa, fertilized at 448 kg N/ha per yr, resulted in a 720-kg/ha increase in NO3-N below the corn root zone during the 3-year study. The NO3-N concentration of the baseflow from the watershed increased during this period, indicating that some of the leached NO3-N reached the groundwater. The watershed fertilized at the recommended N rate (168 kg/ha per yr) did not increase the quantity of NO3-N below the corn root zone; however, some NO3-N leaching did occur. Between April 1971 and April 1974, the accumulation of NO3-N in the profile of the excessively fertilized watershed moved from the 1.0- to 3.1-m depth. The watershed fertilized with 168 kg N/ha per yr did not show any zones of significant NO3-N accumulation in the soil profile at any of the sampling dates. The depth to the water table on the lowest contour sampled on the excessively fertilized watershed was 4.6 and 4.9 m in April 1973, and April 1974, respectively. The average NO3-N concentration for these two sampling dates at the water table depth increased from 3.7 to 12.9 ppm. The average NO3-N concentration at the water table depth on the normally fertilized watershed was 2.0 and 4.5 ppm in April 1973 and April 1974,

respectively, with a water table depth of 3.0 m. (Henley t ISWS)
W76-06401

THICK BH HORIZONS IN THE NORTH CAROLINA COASTAL PLAIN: II: PHYSICAL AND CHEMICAL PROPERTIES AND RATES OF ORGANIC ADDITIONS FROM SURFACE SOURCES,
Soil Conservation Service, Beltsville, Md.
For primary bibliographic entry see Field 2G.
W76-06403

HYDROTHERMAL CONVECTION IN SATURATED POROUS MEDIA,
Bordeaux-1 Univ., Talence (France).
For primary bibliographic entry see Field 2F.
W76-06415

TRANSIENT WATER QUALITY MODELING IN STREAMS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
R. Willis, D. R. Anderson, and J. A. Dracup.
Water Resources Bulletin, Vol. 12, No. 1, p 157-174, February 1976. 4 fig, 1 tab, 17 ref.

Descriptors: *Water quality, *Management, *Simulation analysis, *Nitrogen cycle, Environmental engineering, Planning, Streams, Canals, Dissolved oxygen, Systems analysis, Mathematical models, Equations, *California.
Identifiers: Finite difference approximation, Mass transport equations, *Truckee River(Cal), Transient conditions.

A general planning model for simulation of water quality in streams and canals is formulated and verified. The model simulates the temporal and spatial variations in conservative and nonconservative constituents. The nitrogen cycle and its interaction with other nutrients and the dissolved oxygen resources of the stream are included. A fully implicit finite difference approximation is used to solve the mass transport equations describing variations in constituent concentrations throughout the stream systems. The model is applied to the Truckee River in northern California. Results indicate the applicability of the model for assessing the impact of alternative water quality management strategies on the stream systems. (Bell-Cornell)
W76-06433

GROUND-WATER QUALITY IN SELECTED AREAS SERVICED BY SEPTIC TANKS, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
W. A. J. Pitt, H. C. Mattraw , Jr., and H. Klein.
Open-file report 75-607, 1975. 82 p, 24 fig, 11 tab, 25 ref.

Descriptors: *Water pollution sources, *Groundwater, *Septic tanks, *Florida, Observation wells, Water analysis, Path of pollutants, Aquifer characteristics, Groundwater movement, Physical properties, Chemical analysis, Bacteria, Coliforms, Nitrogen, Phosphorus.
Identifiers: *Dade County(Fla).

During 1971-74, the U. S. Geological Survey investigated the chemical, physical, bacteriological, and virological characteristics of the groundwater in five areas serviced by septic tanks in Dade County, Florida. Samples were collected from wells ranging in depth from 10 to 60 ft. Some enrichment of groundwater with sodium provided a possible key to differentiating septic-tank effluent from other urban groundwater contaminant sources. High ammonia nitrogen, phosphorus, and the repetitive detection of fecal coliform bacteria were characteristic of two 10-foot monitor wells that consistently indicated the presence of septic-tank effluent in groundwater. Fecal coliform bacteria were present on one or two occasions in many wells but the highest concentration, 1,600 colonies/100 ml, was related to storm-water infiltration rather than septic-tank discharge. The groundwater in the more permeable limestone in south Dade County near Homestead contained low concentrations of septic-tank related constituents. In north Dade County, where the aquifer is less permeable, groundwater contained the highest dissolved iron, manganese, COD, and organic carbon. (Woodard-USGS)
W76-06442

HYDROLOGIC DATA FOR THE IDAHO NATIONAL ENGINEERING LABORATORY SITE, IDAHO, 1971 TO 1973,
Geological Survey, Idaho Falls, Idaho.
J. T. Barraclough, and R. G. Jensen.
Available from National Technical Information Service Springfield, Va, 22161 as IDO-22055 $5.50 printed copy; $2.25 microfiche. Open-file report 75-318, January 1976. 52 p, 37 fig, 3 tab, 15 ref.

Descriptors: *Water pollution sources, *Groundwater, *Radioactive wastes, *Injection wells, *Colorado, Chemical wastes, Data collections, Aquifers, Water levels, Groundwater recharge, Path of pollutants, Infiltration, Hydrogeology, Observation wells, Radioactive waste disposal.
Identifiers: *Idaho National Engineering Laboratory, *Waste ponds.

The influence of liquid radioactive and chemical waste disposal is described for the Snake River Plain aquifer at the Idaho National Engineering Laboratory (INEL). In 1971 to 1973, an average of 237 water samples were collected annually, and an average of 600 chemical and radiometric determinations was made annually. An annual average of 817 water-level measurements was made in wells to determine the relations of water-level fluctuations to the movement of wastes. The 25 INEL production wells pumped an annual total of 2.5 billion gallons of water during 1971 to 1973. About 50% of this pumpage was returned to the aquifer. The Test Reactor Area utilizes ponds and a deep well to dispose of about 400 million gallons of dilute wastes per year. About half of the liquid waste is discharged to a radioactive waste pond. Infiltration from the ponds has formed a large perched-water body in the basalt. The perched groundwater body contains tritium, chromium-51, cobalt-60, and strontium-90. The extent and concentration of these radionuclides are shown on maps. A chemical processing plant discharges low-level radioactive waste and chemical waste directly to the Snake River Plain aquifer through a 600-foot disposal well. The distribution of waste products in the Snake River Plain aquifer covers about 15 square miles. Since disposal began in 1952, the wastes have migrated about 5 miles downgradient from discharge points. (Woodard-USGS)
W76-06447

SUBMERGED MULTIPORT DIFFUSERS FOR COOLING WATER DISCHARGE,
Massachusetts Inst. of Tech., Cambridge, Mass. (Assignee).
For primary bibliographic entry see Field 5D.
W76-06464

OREGON SYNTHETIC CLEANSING AGENT ACT,
For primary bibliographic entry see Field 6E.
W76-06502

INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06514

THE EFFECT OF LAND USE ON THE CHEMICAL AND PHYSICAL QUALITY OF SURFACE AND GROUND WATERS IN SMALL WATERSHEDS,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
M. E. Weeks.
Available from the National Technical Information Service, Springfield, Va., as PB-251 890, $3.50 in paper copy, $2.25 in microfiche. Massachusetts Water Resources Center, Amherst, Publication 41, Completion Report 74-7, September 1974. 9 p, 2 tab, 4 ref. OWRT A-040-MASS(1)

Descriptors: *Land use, *Massachusetts, Small watersheds, *Water pollution sources, *Nitrates, *Phosphates, Farm wastes, Domestic wastes, Fertilizers, Water quality, Surface waters, Groundwater, Organic matter.
Identifiers: *South River watershed(Mass).

Results obtained from monitoring surface and ground waters gave only a qualified answer to the question of how to obtain some initial estimate of the effects of different land use patterns on water quality in the small watershed used (South River watershed - part of the Deerfield River and Connecticut River systems). This river is about 15 miles in length and has five named tributary brooks and numerous lesser part-time streams draining the watershed of approximately 16,400 acres. Agricultural wastes come largely from manure produced by the nearly 1100 head of cattle on the farms in the area, and from crop residues and, to a lesser extent, from fertilizers used. The houses of residence, including those in Ashfield and Conway centers, contribute most of the effluents from septic tanks and considerable raw sewage directly to the South River. Eight stations were located at different places along the stream water samples from the river at each of these stations were taken on a monthly basis for analysis. Low ground water phosphate concentrations were always found in lysimeters located in an area of the watershed where different soil management practices could be studied. No evidence of leaching was found from three field sites receiving moderate to sometimes heavy applications of manure and fertilizers. Laboratory and field studies with suction lysimeters on nitrate concentrations in water conclusively show that in many soil situations most of the nitrate-nitrogen not utilized by the crop is lost by denitrification rather than by leaching. The presence of high levels of active organic matter supplied in high application rates of manure are conducive to rapid denitrification.
W76-06552

SUMMARY AND CONCLUSIONS: NUTRIENT TRANSPORT AND ACCOUNTABILITY IN THE LOWER SUSQUEHANNA RIVER BASIN,
Environmental Protection Agency , Annapolis, Md. Annapolis Field Office.
L. J. Clark, V. Guide, and T. H. Pheiffer.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-240 15 $5.00 in paper copy, $2.25 in microfiche. Technical Report 60. October 1974. 94 p, 45 tab, append.

Descriptors: Water quality control, *Eutrophication, Industrial wastes, *Nitrates, Sewage treatment, Water pollution sources, *Nutrient removal, Nitrogen compounds, *Phosphorous compounds, *Water assimilative capacity, *Chesapeake Bay, Water pollution effects, Water pollution treatment, Pennsylvania, Maryland.
Identifiers: Non-point sources, Point source control, *Susquehanna River Basin, Nutrient loading, Northumberland(PA), Conowingo(MD).

Progressive eutrophication of the Chesapeake Bay resulting from discharge of nitrogen and phosphorous in the Susquehanna River between Northumberland, PA, and Conowingo, MD, prompted the EPA to initiate a comprehensive study of the river and to develop a nutri-

management program. Comprised of monitoring and sampling of stream stations and sewage treatment plants, the study developed the following objectives: identification of nitrogen and phosphorous loadings, determination of seasonal variations in loadings; delineation of point and non-point sources; determination of loading rates from agricultural, forestry and urban areas; seasonal mass balance of loadings; and determination of phosphorous 'sinks' resulting from impoundments. Results are presented of data analysis and interpretation utilizing regression analysis to establish relationship between both nutrient concentration and loading versus stream flow. Even with point source phosphorous control, impacts from expected population growth will require consideration of non-point source control as well as high degree of phosphorous and nitrogen removal at point sources. Hopefully, management agencies will utilize these data and expand upon them to develop land use management programs in conjunction with point source control of nutrients. Future studies recommended included fertilizer application studies, significance of construction industry as a non-point source, and determination of non-point sources in urban runoff. (Salzman-North Carolina)
W76-06575

EFFECT OF SALINIZATION ON CERTAIN SOIL MICROFLORA,
Institute for Applied Research on Natural Resources, Baghdad(Iraq).
For primary bibliographic entry see Field 5C.
W76-06582

SURFACE RUNOFF AND ITS EFFECT ON DIFFUSE SALT PRODUCTION FROM MANCOS SHALE MEMBERS,
Utah State University, Logan, Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2G.
W76-06583

FINITE STATE MIXING-CELL MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2F.
W76-06594

WATER QUALITY MODEL FOR SMALL AGRICULTURAL WATERSHED,
West Virginia Univ., Morgantown.
M. H. Meghji.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 940, $6.00 in paper copy, $2.25 in microfiche. PhD thesis, 1975. 142 p. 25 fig., 16 tab., 109 ref., 3 append. OWRT A-012-WVA (1).

Descriptors: *Agricultural watersheds, *Agricultural runoff, *Pollutants, *Mathematical models, *Erosion, Farm wastes, Sediments, Nitrogen, Phosphorus, Organic matter, Specific conductivity, Inorganic compounds, Hydrogen ion concentration, Salts, Bacteria, Calcium, Fertilizers, Magnesium, Sodium, West Virginia, Potassium, Model studies.

A literature review discloses contradictory conclusions as to the extent agricultural runoff contributes to water and air pollution. To investigate the actual and potential importance of agricultural runoff, a study is described which was conducted at the West Virginia University-Morgantown as a basis for a mathematical model to characterize the surface runoff and tile drainage from a small agricultural watershed, including the interrelationships between soil types, hydrologic, climatologic, and pollution indices. Measurements included rainfall, runoff, sediment, organic matter, nutrients, and bacterial densities carried to the stream from surface and subsurface runoff. The predictive model, based on the Universal Soil Loss Equation and regression analysis, held well for the data collected, except for the winter months. The model has a much wider use because it takes into consideration most of the factors thus far identified as affecting the quality of agricultural runoff. Although the constant 'K' in the model related the total-nitrogen, total phosphorus, and COD to sediment, and is specific to this watershed, it can be estimated from soil fertility data and enrichment ratios for other watersheds. It is concluded that erosion rather than fertilizer is a major contributor of pollutants to surface waters although indiscriminate fertilizer use will also be a contributing factor. (Auen-Wisconsin).
W76-06641

CHEMICAL/BIOLOGICAL RELATIONSHIPS RELEVANT TO ECOLOGICAL EFFECTS OF ACID RAINFALL,
National Ecological Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5A.
W76-06650

USE OF SILVER AND ZINC TO TRACE SEWAGE SLUDGE DISPERSAL IN COASTAL WATERS,
Delaware Univ., Newark. Coll. of Marine Studies.
F. Rutherford, and M. Church.
Reprint No. 27 from ACS Symposium Series, No. 18, DEL-SG-3-76, 1975. p 440-452, 4 fig, 2 tab, 11 ref. Sea Grant No. 04-3-158-30.

Descriptors: *Sewage, *Sewage sludge, *Sludge disposal, *Tracers, *Zinc, Sludge, *Dispersion, Movement, Tracking techniques, Coasts, *Path of pollutants, Bays, Pennsylvania, New Jersey, Metals, Bioindicators.
Identifiers: *Sewage sludge dispersal, Coastal waters, *Silver, *Delaware Bay.

Sewage sludge from the municipal plants of Philadelphia, Pennsylvania, and Camden, New Jersey, has been dumped some 12 miles off the mouth of the Delaware Bay from 1961 to 1972 in amounts averaging 389,340 m3/year. Since 1973 the disposal area has been moved some 40 miles off-shore. Assays of silver and zinc in bottom sediments surrounding the Philadelphia dump site were employed to disclose the possible dispersion of sewage sludge. These trace metals are highly concentrated in the secondary treated sewage sludge from the Philadelphia metropolitan area, and display sensitive indications as tracers for the bottom dispersal of the sludge off the mouth of Delaware Bay. From such metal distributions, it is fair to conclude that the sludge has moved out of the former designated area of disposal some tens of miles shoreward, toward the west. A possible link between the sludge and a food web is implicated. (NOAA)
W76-06655

SEWAGE SLUDGE AND AMMONIUM CONCENTRATIONS IN THE NEW YORK BIGHT APEX,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
I. W. Duedall, M. J. Bowman, and H. B. O'Connors Jr.
Estuarine and Coastal Marine Science Vol. 3, p 457-463, 1975, 3 fig, 1 tab, 11 ref. Grants 2-35281 and 5S05RR0767-08

Descriptors: *Sewage sludge, *Sludge, *Sewage disposal, *Sludge disposal, *Waste disposal, *Ammonium compounds, Sampling, Water pollution, Water treatment, Phytoplankton, Waste dumps, New York.
Identifiers: *Ammonium concentrations, *New York Bight Apex, Dump sites, Parachute drogues, Water columns, Water bottom concentrations, Marine life.

Water column ammonium concentrations were determined at several stations at or near the sewage sludge dump site in the New York Bight apex on 30 and 31 July, 1973 and also at several stations located on a perimeter surrounding the dump area. Parachute drogues were used to track the movement of water over a 31-hour period. Within the dump site, ammonium concentrations weremicro matchy and usually increased from surface to bottom with concentrations in the ranges of less than 1UM and 1-9 micro m, respectively. However, at one station that had recently received sludge input, the surface ammonium concentration was over 500 micro m and the bottom concentration was about 200 micro m. All except two background stations showed no significant vertical variation in ammonium. The observations suggest that sludge dumping increases ammonium content of the water column, but that high levels probably do not persist for long periods. (NOAA)
W76-06667

FIELD STUDIES OF THE THERMAL PLUME FROM THE D. C. COOK SUBMERGED DISCHARGE WITH COMPARISONS TO HYDRAULIC-MODEL RESULTS,
Argonne National Lab. Ill. Energy and Environmental Systems Div.
A. A. Frigo, R. A. Paddock, and D. L. McCown.
Publication ANL/WR-75-4, June 1975. 35 p, 33 fig, 4 tab, 9 ref. ERDA W-31-109-Eng38

Descriptors: *Thermal pollution, *Hydrothermal studies, *Nuclear powerplants, *Lake Michigan, Path of pollutants, Testing, Hydraulic models, Diffusion, Discharge(Water), Cooling water, Measurement, On-site data collections, Prototypes, Isotherms, Heat transfer, Water temperature.
Identifiers: Submerged-diffuser discharges, *Waste heat, *Thermal plume, D.C. Cook plant(Mich), Prototype data, Model predictions.

The Donald C. Cook Nuclear Plant at Bridgman, Michigan, uses submerged-diffuser discharges as a means of disposing waste heat into Lake Michigan. This report presented preliminary results of temperature surveys of the thermal plume at the D. C. Cook Plant. Indications are that the spatial extent of the plume at the surface is much smaller than previous results for surface shoreline discharges, particularly in the near and intermediate portions of the plume. Comparisons of limited prototype data with hydraulic (tank)-model predictions indicated that the model predictions for centerline temperature decay at the surface are too high for the initial 200 m from the discharge, but are generally correct beyond this point to the limits of the model. In addition, the hydraulic-model results underestimate the areal extent of the near and intermediate portions of the plume at the surface. Because this is the first report of a new field program, several inadequacies in the field-measurement techniques were noted and discussed. New techniques that have been developed to remedy these deficiencies, and which will be implemented for future field work, were also described. (Morris - ISWS)
W76-06673

THE RATE OF SPREAD OF FUEL OIL NO. 1,
Geological Survey of Sweden, Stockholm.
B. Sellberg.
Nordic Hydrology, Vol. 6, No. 1, p 63-72, 1975. 8 fig, 3 ref.

Descriptors: *Water pollution, *Groundwater, *Oil spills, Oil pollution, Groundwater movement, Sands, Soils, Oil, Soil contamination, On-site investigations, Analytical techniques, Pollutants, Pollutant identification, Path of pollutants.
Identifiers: *Oil movement in soils.

Experiments have been made in the field to determine the way in which fuel oil No. 1 spreads in some common unconsolidated deposits in Sweden, such as esker material, bottom varves of

glacial clay and sand on clay. In the investigations, the velocity of fuel No. 1 in reasonably homogeneous medium sand with a good groundwater flow was found to be 1.0-1.6 m/day, but usually the velocity was as low as 0.1-0.2 m/day. Experiments covering a longer period showed that the maximum concentration diminished very much in transport up to a distance of about 20 m. (Sims-ISWS)
W76-06677

MONITORING GROUND-WATER QUALITY NEAR A SANITARY LANDFILL,
Earthview, Incorporated, Toledo, Ohio.
For primary bibliographic entry see Field 5A.
W76-06684

STUDY OF THE DISPERSION OF BACTERIOPHAGES IN A NATURAL MARINE ENVIRONMENT, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France); and Institut National de la Recherche Medicale, Paris (France).
C. Pietri, J. P. Breittmayer, M. Aubert, and M. Gauthier.
Rev Int Oceanogr Med 39/40, p 95-108, 1975.

Descriptors: *Bacteriophages, *Dispersion, *Path of pollutants, Dye dispersion, Rhodamine, Sea water, Marine environment, Tracers.

The dispersion of P22 and T4 bacteriophages in the sea was compared with the diffusion of the dye Rhodamine B; no difference was found. There apparently is neither adsorption of these bacteriophages on particles in aqueous systems, nor activation by seawater in terms of time.--Copyright 1975, Biological Abstracts, Inc.
W76-06691

TELEDETECTION BY AIRPLANE AND SATELLITE IN THE STUDY OF MARINE POLLUTION, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 5A.
W76-06717

PHOSPHORUS SOURCES FOR THE LOWER MADISON LAKES,
Wisconsin Univ., Madison. Water Chemistry Lab.
W. Sonzogni, and G. F. Lee.
Wisconsin Academy of Sciences, Arts and Letters, Vol. 63, p. 162-175, 1975. 1 fig., 12 tab., 19 ref. EPA 16010EHR.

Descriptors: *Phosphorus, *Lakes, Wisconsin, Agricultural runoff, Urban runoff, Land use, Precipitation(Atmospheric), Fallout.
Identifiers: *Madison(Wis), *Phosphorus sources, Lake Monona(Wis), Lake Mendota(Wis), Lake Waubesa(Wis), Lake Kegonsa(Wis), Yahara River(Wis).

The soluble orthophosphate and total phosphorus loading to and outflow from the lower of the chain of lakes (Monona, Waubesa, and Kegonsa) in Madison, Wisconsin are estimated to determine the effect of diversion of sewage effluents. The largest phosphorus source to these lakes is the Yahara River; i.e., for each of the lower lakes the outflow from the higher lake in the chain is the principal source. In contrast, the headwater Lake Mendota, with a much larger drainage basin, receives most of its phosphorus input from rural runoff. Rural runoff is the second most important phosphorus source to Lakes Waubesa and Kegonsa, but loading estimates are much lower than the pre-diversion estimates. Despite the reduction in the phosphorus loading, these lakes are still highly eutrophic. Urbanization within the Lake Mendota watershed is projected to double by 1900, nevertheless the increase in phosphorus loading would be small compared to the total load dominated by the Yahara River. The effect of urbanization would be significant, however, if new urban areas were at one time marshes. It is estimated that southeastern Wisconsin marshes could yield on the order of 45 kg of phosphorus/ha upon drainage. (Auen-Wisconsin)
W76-06718

DEGREE OF POLLUTION OF THE SAINT LAWRENCE RIVER FROM REPENTIGNY TO MONTMAGNY, (IN FRENCH),
Laval Univ., Quebec. Departement des Vivres.
J. G. Noel, and R. E. Simard.
Nat Can (Que) 102(2), p 199-208, 1975.

Descriptors: *St. Lawrence River, *Canada, *Bacteria, Microbiology, Coliforms, Streptococcus, Water quality standards, *Path of pollutants, Bioindicators, Wastes, Molds, Yeasts.
Identifiers: Montnagny, Ontario, Quebec, Repentigny.

The microbial water pollution level of the St. Lawrence River between Repentigny and Montmagny (Quebec, Canada) was studied from June-Sept. 1971. This area was divided into 31 sampling stations and averages of 450,000 total bacteria, 1100 total coliforms, 200 fecal coliforms, 45 fecal streptococci and 1300 yeasts and molds were found per 100 ml of water. These groups of microorganisms are the principal indicators of microbial contamination of water from domestic, human, animal, agricultural and industrial wastes. The results obtained from this microbiological survey, compared to those obtained from the Great Lakes and from the International Section of the St. Lawrence River and to the water quality criteria and Canada and Ontario, showed that a high level of microbial contamination occurs in the St. Lawrence River. The highest polluted stations were those of Sorel, Trois-Rivieres, Quebec and the north channel of the River at the Orleans Island. (See also W76-06735)--Copyright 1975, Biological Abstracts, Inc.
W76-06734

DEGREE OF POLLUTION OF THE SAINT LAWRENCE RIVER FROM REPENTIGNY TO MONTMAGNY: II. BIOCHEMICAL POLLUTION, (IN FRENCH),
Laval Univ., Quebec. Departement Des Vivres.
J. G. Noel, and R. E. Simard.
Nat Can (Que) 102(2), p 209-218, 1975.

Descriptors: *St. Lawrence River, *Canada, *Biochemistry, *Path of pollutants, Nitrates, Nitrogen, Chemical oxygen demand, Wastes, Bioindicatory, Phosphates.
Identifiers: Ammonia nitrogen, Quebec, Repentigny, Montmagny.

The biochemical water pollution level of the St. Lawrence River studied from Repentigny to Montmagny (Quebec, Canada) during June-Sept. 1971. This area covered was divided into 31 sampling sections and the mean results in mg/liter were 0.522 organic nitrogen (Keljdahl-nitrogen), 0.280 ammonia nitrogen, 0.515 nitrate, 0.061 orthophosphate, 21.3 chemical 02 demand. These compounds are the principal indicators of biochemical water pollution from domestic, agricultural, animal and industrial wastes. The results obtained which were compared to those from the Great Lakes, the International Section of the St. Lawrence River and to the water quality criteria in Canada and Ontario show that a high level of pollution occurs in the St. Lawrence River, particularly near Repentigny, Tracy, Trois-Rivieres, Donnacona, Quebec and the North and South Brance of the River at the Orleans Island. (See also W76-06734)--Copyright 1975, Biological Abstracts, Inc.
W76-06735

THE WINTER DISTRIBUTION OF ULTRAVIOLET ABSORPTION IN THE SURFACE WATERS OFF THE WEST COAST OF THE BRITISH ISLES,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, and A. W. Morris.
Environ Pollut. 7(2), p 121-132, 1974.

Descriptors: *Salinity, Coasts, Oceans, *Ultraviolet radiation, Measurement, *Path of pollutants, *Organic matter, Estuaris, *Distribution, Water pollution, Absorption, Surface water.

Concurrent measurements of salinity and the integrated UV absorption in the wavelength range 250-350 nm were made in the surface waters of Beaumaris, Cardigan and Liverpool Bays during the winter. Organic matter derived from land drainage rather than that produced by in situ biological activity controlled the magnitude of the absorption. The high absorptions recorded in Liverpool Bay were principally attributed to greater fluvial discharge rather than to absorption enhancement from polluted sources. It was not possible to distinguish spectrally any contribution to the dissolved organic matter from industrial or domestic sources. The increase in absorption caused by a decrease of 1‰ in salinity was greater in Liverpool Bay than in Cardigan Bay, principally as a result of the relatively high concentrations of dissolved UV absorbing organic matter in waters adjacent to the river Mersey estuary.--Copyright 1975, Biological Abstracts, Inc.
W76-06739

SEASONAL DISTRIBUTION OF ULTRAVIOLET ABSORPTION IN THE SURFACE WATERS OF LIVERPOOL BAY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, and A. W. Morris.
Estuarine Coastal Mar Sci. 2(3), p 283-290, 1974.

Descriptors: Seasonal, *Distribution, *Salinity, Surface water, *Organic matter, *Ultraviolet radiation, Estuaries, *Path of pollutants, Bays, Water pollution, Absorption, Rivers.
Identifiers: Liverpool Bay(England).

Concurrent measurements of saliniity and the integratd UV absorption in the wavelength range 250-350 nm were made in the surface waters of Liverpool Bay (England) during 4 cruises conducted in Sept. and Dec. 1970 and March and July 1971. Except during Sept. the distribution and magnitude of the UV absorption were predominantly influenced by organic matter introduced from land sources rather than by in situ biological activity. Highest values of ultraviolet absorption consistently occurred adjacent to the estuariew of the River Mersey and River Ribble. Waters from the River Mersey were organically 'dirty' relative to all other freshwater sources in the area.--Copyright 1975, Biological Abstracts, Inc.
W76-06740

NITRATES IN KANSAS GROUNDWATERS AS RELATED TO ANIMAL AND HUMAN HEALTH,
Kansas State Univ., Manhattan. Comparative Toxicology Lab.
W. E. Ridder, F. W. Oehme, and D. C. Kelley.
Toxicology. 2(4), p 397-405, 1974.

Descriptors: Nitrates, Kansas, Animal diseases, Human diseases, Water wells, Groundwater, Water pollution sources, Potable water, Public health, Fertilizers.

Sources of nitrates observed in farm well water appear related to improper location and construction of wells. Statistical analysis of the low levels of applied inorganic N fertilizer suggest that the fertilizer applied was not related to the nitrate con

tent of the water. Although the presence of animal health problems did not correlate with levels of nitrates in well waters and with the use of inorganic fertilizers, the presence of many variables made evaluation difficult. The nitrate levels in many rural and domestic water supplies were sufficiently high to potentially produce physiological impairment in animals drinking those waters. Clinical signs may have been obscured by their own complexity and subtleness. The significance of nitrates in drinking waters can currently be objectively measured only by the development of acute nitrate poisoning.--Copyright 1975, Biological Abstracts, Inc.
W76-06754

SEQUENCES OF EFFECTS OF A CITY SEWER: AS A FUNCTION OF THE REMOVAL OF THE SOURCE OF POLLUTION, ON THE PHOTOPHILE POPULATIONS GROWING IN EXPOSED PLACES (ALGAL FRACTION); FIRST RESULTS, (IN FRENCH),
Aix-Marseille-2 Univ. (France). Laboratoire de Biologie Vegetale.
For primary bibliographic entry see Field 5C.
W76-06770

THE HEAVY METAL CONCENTRATIONS IN THE MARINE SEDIMENTS ALONG THE COAST OF FUKUYAMA, (IN JAPANESE),
Kagoshima Univ. (Japan). Marine Biology Lab.; and Kagoshima Univ. (Japan). Environmental Sciences.
For primary bibliographic entry see Field 5A.
W76-06774

SUSPENDED MATTER AND ITS COMPONENTS IN THE BLACK SEA, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
D. M. Vityuk.
Gidrobiol Zh 11(1), 12-18, 1975.

Descriptors: Bacteria, Assay, Suspended solids, Plankton, Metals, Sulfides, Sea water.
Identifiers: *Black Sea, USSR.

Assays of suspended matter (40) from the Black Sea near the Danube mouth, at the Bosporus and in the central part of the Sea were examined in Nov. 1971. The data are compared with previously performed analyses from the Sevastopol area and the mouths of 19 rivers flowing into the Black and Azov Seas (USSR). The two main types of Black Sea suspension are of autochthonous and allochthonous origin. The formation of insoluble metal sulfides in deep water, specific for the Black Sea, is 1 of the sources of autochthonous suspended material. The carbonate portion of the mineral part of the Danube suspended material does not usually exceed 7%, in the mineral part of the abyssal region it is above 25%.--Copyright 1975, Biological Abstracts, Inc.
W76-06778

5C. Effects Of Pollution

NITROGEN, PHOSPHORUS AND CARBON FLUX IN CHESAPEAKE BAY MARSHES,
Virginia Inst. of Marine Science, Gloucester Point.
D. M. Axelrad, K. A. Moore, and M. E. Bender.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-251 549, $5.00 in paper copy, $2.25 in microfiche. Virginia Water Resources Research Center, Blacksburg, VWRRC Bulletin 79, January 1976. 182 p. 53 fig, 17 tab, 106 ref, 2 append. OWRT B-027-VA (2).

Descriptors: *Nitrogen, Estuaries, *Phosphorus, *Nitrogen fixation, Marshes, *Carbon, Detritus, *Chesapeake Bay, Algae, *Virginia, *Salt marshes, Wetlands, Nitrates, Nitrites, Dissolved solids, *Nitrogen cycle, *Cycling nutrients, Path of pollutants.
Identifiers: Spartina, Dissolved carbon, Benthic algae, Organic carbon.

Annual nitrogen, phosphorus and carbon budgets for two Virginia salt marshes were determined by monthly measurements of water discharge and constituent concentrations over tidal cycles. Considering all three forms of phosphorus measured (total, dissolved organic and orthophosphate) there was a net loss from the estuary to the marshes. The data reveal a loss of particulate phosphorus of estuarine origin to marsh sediments and mineralization of this phosphorus in the marshes with subsequent export of dissolved inorganic and organic phosphorus back to the estuary. Nitrogen flux data show a loss of nitrate and nitrite to the marshes. Particulate nitrogen is imported to the marshes where it is mineralized and returned to the estuary as ammonia and dissolved organic nitrogen. The magnitude of nitrogen export suggests significant fixation of atmospheric nitrogen by marsh flora with subsequent export as dissolved species. Carbon flux data show significant contributions of both particulate and dissolved organic carbon to the estuary from the marshes. Estimates of export, based on marsh grass productivity, suggest a loss of 36 and 49 percent of a year's primary production on the marshes as detritus for Ware and Carter Creeks respectively.
W76-06162

THE WATER FAUNA OF THE HIGH MOUNTAIN GLACIER LAKES IN THE MANDARAS VALLEY IN THE HIGH HINDU KUSH, (IN POLISH),
Jagellonian Univ., Krakow (Poland). Instytut Zoologii Systematics; and Jagellonian Univ., Krakow (Poland). Instytut Zoogeography.
J. Wojtusiak, K. Sowa, and A. Kownacki.
Przegl Zool 19(1), p 66-70, 1975.

Descriptors: *Aquatic animals, *Lakes, Diptera, Algae, Chironomidae, Water pollution effects.
Identifiers: *Afghanistan(High Hindu Kush), Allocapniella-Pedestris, Capnia-SPP, *Glacier lakes, Hindu, Kush, Mandaras, Microspectra, Oedogoniales, Pseudodiamesa-Sp

The water fauna of 2 glacier lakes at an elevation of about 5000 m in the Mandaras valley in the High Hindu Kush (Afganistan) are described. Two species Capnia Pict., Allocapniella pedestris (Kimmins) sensu Kawai (Plecoptera, Capniidae), Pseudodiamesa sp., Microspectra sp. (Diptera, Chironomidae) and some algae belonging to the Oedogoniales are reported.--Copyright 1975, Biological Abstracts, Inc.
W76-06166

ENERGY AND POLLUTION CONCERNS IN DREDGING,
Army Engineer Div. South Atlantic, Atlanta, Ga.
A. W. Mohr.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 101, No. WW4, Proceedings Paper 11733, p 405-417, November 1975. 4 fig, 1 tab, 3 ref, 2 append.

Descriptors: *Dredging, *Canals, Channels, Construction equipment, *Energy, Air pollution, Excavation, Earth handling equipment, Sediments, Environmental engineering, Slurries, Land reclamation, Solid wastes, Water pollution.
Identifiers: *Dredges, *Waterways, Excavating equipment.

Dredging equipment in the United States should be augmented for a more versatile dredging fleet by the addition of the mechanical bucket ladder dredge for channel work. The addition of the bucket ladder dredge is especially desired in view of the relatively new concerns of energy conservation and pollution abatement. From these concerns, the former is well defined but the latter is not. In most cases both concerns oppose each other and interfere with the conventional concept of economy. The new concerns are expected to shift the conventional concept of economy toward efficiency in terms of amount of bottom density material dredged, transported, and deposited per unit of fuel. This shift is expected to be accompanied by a change in emphasis from maximum solid flow rate toward maximum effluent density. Bucket ladder dredges are inherently well suited to satisfy the new concerns, especially at long transport distances. (Roberts - ISWS)
W76-06183

ACETYLENE REDUCTION ASSAYS FOR NITROGEN FIXATION IN FRESHWATERS: A NOTE OF CAUTION,
Manitoba Univ., Winnipeg. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W76-06202

THE BIOGEOCHEMISTRY OF PHOSPHORUS IN AN EXPERIMENTAL LAKE ENVIRONMENT: EVIDENCE FOR THE FORMATION OF HUMIC-METAL-PHOSPHATE COMPLEXES,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
T. A. Jackson, and D. W. Schindler.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 211-221, 1975. 11 fig., 1 tab., 14 ref.

Descriptors: *Cycling nutrients, *Chelation, *Phosphorus, *Humus, Chemical reactions, Bottom sediments, Microorganisms, *Canada, Iron, Aluminum, Carbon, Fulvic acids, Humic acids, Lakes.
Identifiers: *Phosphorylation.

Movements, transformations, and interactions with humic matter of P32 labeled orthophosphate were studied in outdoor pools containing lake water, lake water + bottom mud, or lake water + bottom mud + formalin. Microorganisms changed dissolved P32 phosphate into higher molecular weight substances and accelerated transfer of dissolved P32 to mud. Water and mud were fractionated and subjected to gel filtration, then analyzed. Most lake water P32 was water-extractable. Most P32 in mud was non-extractable and the extractable portion was concentrated in the sodium hydroxide extract. Phosphorus was always associated with iron and aluminum, not calcium. P32 was highest in fractions richest in humic matter. In Sephadex fractions of alkali-extracted humic matter from mud, iron, aluminum, and phosphorus were correlated with organic carbon. There was a relationship between P32 bound per micromole iron + aluminum and the molecular structure of humic matter and an inverse relationship between P32 and total phosphorus per micromole iron + aluminum. It is concluded that phosphorus was bound to iron and aluminum complexes of humic matter. Added P32 coordinated only to iron and aluminum atoms not already saturated with phosphorus. More P32 was bound per mole iron + aluminum in fulvic acid than in humic acid fractions. (Buchanan-Davidson--Wisconsin)
W76-06203

THE PHYTOPLANKTON AND PRIMARY PRODUCTIVITY OF SOUTHERN INDIAN LAKE (MANITOBA), A HIGH LATITUDE, RIVERINE LAKE,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
R. E. Hecky.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 509-605, 1975. 3 fig., 2 tab., 6 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Canada, Lakes, Rivers, Phosphorus, Biomass, Chlorophyll, Nutrients, Light penetra-

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tion, Discharge(Water), Inflow, Dominant organisms, Water circulation.
Identifiers: *Riverine lakes, *Southern Indian Lake, Manitoba, *Churchill River(Manitoba), River plumes, Melosira, Nutrient sources.

Southern Indian Lake, Manitoba, was studied to determine mechanisms causing high production in this riverine lake and to assess the river's role in maintaining productivity. Although mean water residence time was 9 months in the entire lake, the Churchill River plume was renewed every two-three months and was the source of a relatively high phosphorus load. Lake mainstem stations had higher average algal biomass and chlorophyll concentrations than regions receiving local drainage; these correlated with estimated phosphorus loadings, but algal biomass and chlorophyll ranges were less than expected from nutrient considerations. Biomass and Secchi disk depths increased from inlet to outlet. Increasing clarity away from the inlet was due to sedimentation. In the mainstem, Melosira dominated during phytoplankton maxima. Nutrients declined rapidly with onset of spring bloom. The two phytoplankton maxima occurred earlier near the inlet than the outlet; this was not due to differential heating but was flow related, suggesting that nutrient recharge from the river after the spring bloom was required to initiate the second maximum. Productivity experiments indicated that in late summer upstream lake regions were in a period of population replacement or decline, while the lower lake had actively growing populations and higher production rates. (Buchanan-Davidson--Wisconsin)
W76-06204

ALGAE FROM MONTANE STREAMS ON THE ISLAND OF MAHE, IN THE SEYCHELLES,
Polish Academy of Sciences, Krakow. Instytut Botaniki.
K. Starmach.
Acta Hydrobiologica, Vol. 17, No. 3, p. 201-209, 1975. 4 fig., 8 ref.

Descriptors: *Systematics, *Algae, *Streams, Islands, Cyanophyta, Chlorophyta, Rhodophyta, Diatoms, Periphyton, Varieties, Africa, *Indian Ocean.
Identifiers: Mahe Island, *Seychelles Islands.

Samples of algae were collected in mountain streams on the Island of Mahe in the Seychelles Island group located in the west Indian Ocean north of Madagascar. Six species of blue-green algae (Homoeothrix juliana, Calothrix muscicola nova sp. ad interim, Scytonema bohneri, Lyngbya kutzingii, L. aerugineo-coerulea, and L. amplivaginata), one species of green algae (Oedogonium sp. Penium polymorphum), and one species of red algae (Batrachospermum capensis spec. nova) were identified. Detailed descriptions are presented for all algae found. The blue-green alga, Calothrix muscicola, is probably a new species, differing in size and in the absence of swelling at the base from C. epiphytica or C. stellaris. Twenty species of diatoms were also identified and the frequency of their distribution recorded; Achnanthes minutissima, Eunotia arcus var. fallax, Eunotia fallax, Frustulia saxonica var leptocephala, and Gomphonema gracile were the most common. (Buchanan-Davidson--Wisconsin)
W76-06205

ALGAE IN THE GEBEL MARRA MTS IN WEST SUDAN,
Polish Academy of Sciences, Krakow. Instytut Botaniki.
K. Starmach.
Acta Hydrobiologica, Vol. 17, No. 3, p. 211-221, 1975. 5 fig, 1 tab., 3 ref.

Descriptors: *Algae, *Chlorophyta, *Cyanophyta, *Diatoms, *Rhodophyta, *Africa, Speciation, Systematics, Nostoc, Cladophora, Variety, Subtropic, Foods, Diets.
Identifiers: *Gebel Marra (Sudan), Lake Dariba, Spirulina platensis, Spirulina massartii, Dermocarpa xenococcoides, Nostochopi lobatus, Biddulphia levis, Fragilaria pinnata, Epithemia turgida, Rhopalodia gibberula var. van heurckii, Rhizoclonium, Spirogyra, Mougeotia, Oedogonium, Tribonema, Audouinella.

Algae collected at five different sites in the volcanic Gebel Marra Mountains of West Sudan in 1964 were identified. A total of 31 different species of blue-green algae, 3 species of green algae, and 34 species of diatoms are described. Taxonomic studies were made of each algal species. The frequency of distribution of the various diatom species is indicated. The blue-green algae were the most common; the most characteristic of these were Spirulina platensis and S. massartii, which produced blooms in Lake Dariba. This species occurs in masses in subtropical countries and that of Lake Chad (Africa) is used as food by the natives, and is considered more digestible than Chlorella. Various species of Nostoc and Dermocarpa xenococcoides and Nostchopsis lobatus, which are found only in tropical regions, were also present. The most characteristic and frequently found species of diatoms were Biddulphia levis, Fragilaria pinnata, Epithemia turgida, and Rhopalodia gibberula var. van heurckii. Smaller numbers of other species were also found. In the green algae, filamentous forms such as Rhizoclonium, Cladophora, Spirogyra, Mougeotia, Oedogonium, and Tribonema were found. The red alga Audouinella was also present; the blue-green alga Dermocarpa xenococcoides was always present on the filaments of this alga. (buchanan-Davidson--Wisconsin).
W76-06206

WATER CHEMISTRY AND FERTILITY OF TWENTY-THREE CONNECTICUT LAKES,
Connecticut Agricultural Experiment Station, New Haven.
W. A. Norvell, and C. R. Frink.

Descriptors: *Water chemistry, *Lakes, *Eutrophication, *Connecticut, Turbidity, Color, Nitrogen, Phosphorus, Specific conductivity, Alkalinity, Calcium, Magnesium, Chlorophyll, Oxygen sag, Potassium, Chlorine, Lake morphology, Bicarbonates, Trophic level.

The water chemistry of twenty-three Connecticut lakes was studied in fall of 1973 and spring and summer of 1974 in order to evaluate the current condition of the lakes with respect to the plant nutrients, nitrogen and phosphorus; to determine which lakes have changed significantly during the last few decades; and to understand factors contributing to the eutrophication of these lake. The lakes range from clear, infertile, oligotrophic water to turbid, highly fertile eutrophic water subject to excessive growth of algae and aquatic weeds. Many became eutrophic during the last few decades. Generally the concentrations of phosphorus and chlorophyll-a have increased and transparency decreased. During the summer, oxygen supplies in deep water are low. Algal populations, measured as chlorophyll-a were closely related to phosphorus concentrations. Phosphorus was in shorter supply than nitrogen in most lakes and is the nutrient most likely to limit algal growth. Eutrophication of these lakes undoubtedly associated with changes in type and intensity of land use in their watersheds. The appendix shows the sampling date and depth, the transparency, alkalinity, chlorophyll-a soluble phosphorus, total phosphorus, ammonia nitrogen, nitrate-nitrogen, soluble nitrogen and total nitrogen for each lake. (Buchanan-Davidson--Wisconsin).
W76-06207

NITROGEN AND SULFUR CONTENT AND PH OF PRECIPITATION IN IOWA,
Iowa State Univ., Ames. Dept. of Agronomy.
M. A. Tabatabai, and J. M. Laflen.
Journal Environmental Quality, Vol. 5, No. 1, p. 108-112, 1976. 2 fig., 4 tab., 34 ref. 1845. IA50010.

Descriptors: *Nitrogen, *Sulfur, *Hydrogen ion concentration, *Precipitation(Atmospheric), *Nutrients, Snow, Rain, Nitrates, Ammonia, Sulfates, Phosphates, Phosphorus, Annual, *Iowa.

To determine pH, ammonia nitrogen, nitrate nitrogen, sulfate sulfur, and phosphate phosphorus concentrations contained in precipitation in Iowa, and to determine what quantities of these nutrients are added annually by precipitation, six terrestrial sites were sampled between September 1971 and December 1973. Annual amounts of ammonia nitrogen and nitrate nitrogen added by precipitation were approximately equal. The annual amount inorganic nitrogen added per hectare ranged from 10 kg in north-central Iowa to 14 kg in west-central Iowa. Annual amount of sulfate sulfur added per hectare ranged from 13 kg in the northeast to 17 kg in the north-central. It was estimated that precipitation added an average of about 0.6 kg ammonia nitrogen, 0.6 kg nitrate nitrogen, and 1.5 kg sulfate sulfur per hectare monthly. Seasonal variations were observed for sulfate sulfur as values were higher in fall and winter than in spring and summer. The average annual pH was 6 in rainfall and snowfall both years; pH values were rarely as low as 4. The phosphorus content of precipitation was very small; at the most only about 0.1 kg of water soluble phosphate phosphorus was added annually per hectare. Nitrate nitrogen was not found in any precipitation sample analyzed. (Buchanan-Davidson--Wisconsin)
W76-06208

THE IMPORTANCE OF DIURNAL VARIATION OF PHOTOSYNTHESIS VS. LIGHT CURVES TO ESTIMATES OF INTEGRAL PRIMARY PRODUCTION,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
E. J. Fee.
Verhandlungen International Vereinigung Limnologie, Vol. 19, p. 39-46, 1975. 3 fig., 1 tab., 21 ref.

Descriptors: *Estimating, *Diurnal, *Photosynthesis, *Light intensity, *Primary productivity, Phytoplankton, Measurement, *Canada, Model studies, Time, Lakes, Annual.
Identifiers: Experimental Lakes Area(Ontario).

A method of estimating integral phytoplankton primary production based on photosynthetic response to light in an incubator, light extinction in the water body, and distribution of surface light over time using a digital computer program was modified incorporate variation of photosynthesis versus light curve during the day. Three lakes in the Experimental Lakes area, Ontario, were the study sites. There was no consistent change of photosynthetic rate over days at low irradiances accounting for interaction between light and time. Results were summarized for computer analysis as follows: production at all irradiances was invariant from sunrise until noon, then declined linearly to minimum production at sunset. This model was incorporated into the computer program and used to compute annual lake basis productivity. A second model was developed assuming no diurnal variation at low irradiances. Another model used exponential rather than linear interpolation to compute production from incubator data. Samples should be taken in the morning to obtain comparable data. In calculating integral daily production, it is not important to incorporate diurnal variation effects, since sampling and data analysis errors are often greater. Simple simulation models can demonstrate the actual significance of seemingly important relationships like diurnal variation. (Buchanan-Davidson--Wisconsin).
W76-06210

ANNUAL DEVELOPMENT OF PLANKTON IN A RIVER WATER INTAKE WEIR AND IN A TREATMENT POND AND ITS REMOVAL IN TREATMENT PLANTS,
nstytut Ksztaltowania Srodowiska, Warsaw (Poland). Zaklad Uzytkowania i Ochrony Wod.
H. Klimowicz.
Acta Hydrobiologica, Vol. 17, No. 3, p. 299-308, 1975. 2 fig., 8 ref.

Descriptors: Resistance, *Plankton, *Water purification, *Water treatment, Water intakes, Varieties, Chlorination, Coagulation, Filtration, Settling basins, *Weirs.
Identifiers: *Uszwica River(Poland).

Seasonal qualitative and quantitative phytoplankton changes in a river intake weir on the Uszwica River, Poland, and a settling pond were investigated to determine their tolerance to several water purification stages. Diatoms numbers increased from intake to the middle of the pond, then decreased. Numbers of algae, protozoa, and rotifers increased throughout the pond length. Phytoplankton (especially diatoms) dominated all year, but zooplankton were rare. Species are classified by rates at which they were removed by water treatment (concrete settling tank with added coagulant, sand filtration, chlorination). Ninety-five taxonomic units were identified; forty-two were found in completely treated water, but specimen numbers were greatly reduced. Curves illustrating development of organisms in the pond and river intake were similar. Seasonal changes in plankton numbers seemed due to changes in mean water temperature. High dissolved oxygen and pH values of 7.1-7.6 were favorable to plankton growth. Fluctuations in water turbidity paralleled the total number of organisms. Turbid water was chiefly polluted with mineral rather than organic compounds. Rapid exchange ofriver water in the pond prevented plankton blooms. Plankton can be used to record changes occurring in treated water and evaluate treatment methods. (Buchanan-Davidson--Wisconsin).
W76-06211

CHANGES IN WATER QUALITY IN FINNISH LAKES AND RIVERS 1962-1973 (IN FINNISH WITH ENGLISH SUMMARY),
National Water Board of Finland, Helsinki. Research Inst.
R. Laaksonen.
Report No. 12, 1975. 66 p. 64 fig., 5 tab., 3 ref., 2 append.

Descriptors: *Water pollution, *Water quality, *Lakes, *Rivers, Specific conductivity, Chlorides, Sulfur, Regression analysis, Running waters, Autumn, Nitrogen, Alkalinity, Electrolytes, Acidity.
Identifiers: *Finland.

Water quality studies of Finnish lakes and rivers from 1962-1973 showed that conductivity, chloride, and total sulfur had increased in running waters. Observations were insufficient to adequately describe the dynamic processes taking place. More changes were observed in the autumn than the spring. Leaching was important. Water quality changes were slightly more frequent in deep water than in running water. More changes were observed at 5 m depths and fewer changes in water near the bottom. Salt concentrations increased in many deep water stations; oxygen levels varied; total nitrogen sometimes increased; and alkalinity sometimes decreased. Water quality changes were more common in the great lake systems than in waters near the coast or in northern Finland waters. Water quality had deteriorated in some areas but seemed to be improving in other areas. Electrolytes were high in river systems in the south and southwest. Salts, sulfur, and chloride increases were less frequent in the great lakes and not observed near the southwest coast. Acidity decreased in rivers on the south and southwest coasts. Fewer changes were observed in waters on the Ostrobothnian coast than in Lake Finland. Detailed tables of lotic and lentic waters show the trend of their components at the 95% confidence level. (Buchanan-Davidson--Wisconsin).
W76-06212

THE PLANKTONIC CRUSTACEANS OF MONCOVE LAKE, MONROE COUNTY, W. VA.,
Arizona State Univ., Tempe. Dept. of Zoology.
W. W. Taylor.
Proceedings West Virginia Academy of Science, Vol. 46, p. 223-229, 1974. 4 tab., 9 ref.

Descriptors: *Reservoirs, *Crustaceans, *West Virginia, Varieties, *Daphnia, *Zooplankton, Oligotrophy, Dominant organisms.
Identifiers: *Moncove Lake(W Va), Bosmina longirostris, Alona, Daphnia catawba, Daphnia ambigua, Mesocyclops edax, Diaptomus pallidus.

Moncove Lake, West Virginia, a small impoundment used for sport fishing, was studied from August 1972-August 1973 to determine planktonic crustacean abundances and species composition. Samples were removed with replicate vertical tows from 0.5 m above the bottom at two sites. The crustacean community consisted of Bosmina longirostris, Alona sp., Daphnia catawba, Daphnia ambigua, Mesocyclops edax, and Diaptomus pallidus. Total crustacean abundance at both stations followed the same seasonal pattern, but changes were usually detected first at the upstream station. The upstream station contained a greater yearly mean crustacean density and more individuals/sq cm in summer; mean crustacean abundance during the growing season was not significantly different. D. ambigue, D. catawba, and M. edax were the dominant zooplankton at both stations, but abundances varied. D. ambigua and M. edax populations were highest at the upstream station; D. catawba was highest at the downstream station. Total crustaceans and individual abundance followed the same general pattern. D. ambigua was the first dominant species to reach maximum densities at both stations; D. catawba reached maximum density next at the lower station, followed by M. edax. The reverse was true at the upper station. Moncove Lake was considered oligotrophic. (Buchanan-Davidson--Wisconsin).
W76-06214

AQUATIC INSECTS OF WISCONSIN,
Wisconsin Univ., Madison. Dept. of Entomology.
W. L. Hilsenhoff.
Wisconsin Department of Natural Resources Technical Bulletin No. 89, 1975. 53 p. 352 fig., 79 ref.

Descriptors: *Wisconsin, *Aquatic insects, *Systematics, Varieties, Ecology, Distribution, Stoneflies, Mayflies, Dragonflies, Caddisflies, Lacewings, Midges, Diptera, Water beetles, Insect control.
Identifiers: Megaloptera, Hemiptera, Neuroptera, Lepidoptera, Coleoptera.

Taxonomic advances have been made since keys to genera of insects in North America were published. Due to increased interest in the aquatic environment, generic keys have been prepared for aquatic insects occurring in Wisconsin. The keys are restricted to genera which are likely to be found in Wisconsin and include only the aquatic stages of these genera. General information on the biology, ecological requirements, distribution, and abundance of genera in Wisconsin is included. Each key has an appended list of species which occur in Wisconsin; species and genera that may occur but have not yet been collected are marked with an asterisk. References to recent keys to species that are not monotypic are included for most orders. Because of uncertainty in identification, no list of species is appended for Diptera, Lepidoptera, and Neuroptera. No effort was made to denote species of Ephemeroptera not collected in Wisconsin. Keys are presented for Plecoptera (stoneflies), Ephemeroptera (mayflies), Odonata (dragonflies), aquatic Hemiptera (bugs), Trichoptera (caddisflies), Megaloptera (fishflies and alderflies), aquatic Neuroptera (spongilia flies), aquatic Lepidoptera (moths), aquatic Coleoptera (beetles), and aquatic Diptera (flies and midges). A glossary of terms used in the keys is included. (Buchanan-Davidson--Wisconsin).
W76-06215

ECOLOGY AND BIOGEOGRAPHY OF MAYFLIES (EPHEMEROPTERA) OF RUNNING WATERS IN THE POLISH PART OF THE CARPATHIANS. I. DISTRIBUTION AND QUANTITATIVE ANALYSIS,
Jagellonian Univ., Krakow (Poland). Dept. of Hydrobiology.
R. Sowa.
Acta Hydrobiologica, Vol. 17, No. 3, p. 223-297, 1975. 8 fig., 18 tab., 120 ref.

Descriptors: *Ecological distribution, *Biogeography, *Mayflies, *Rivers, *Distribution patterns, Physicochemical properties, Streams, Water levels, Velocity, Temperature, Turbidity, Hydrogen ion concentration, Hardness(Water), Oxygen, Varieties, Dominant organisms, Habitats, Seasonal, Speciation, Europe.
Identifiers: *Poland, *Carpathian Mountains(Poland), Nymphs.

Mayfly abundance and distribution were studied in running waters in the Polish portion of the Carpathian Mountains and in the territory bounded by the Vistula and San Rivers. Previous studies are also reviewed. Sixty-eight streams ranging from high mountain streams to lowland rivers were studied between 1958-1972. Each region and sampling station is carefully described and physicochemical environmental factors indicated, i.e., variations in water level and flows, current velocity, temperature, turbidity, pH, hardness, oxygen. Over 3346 winged mayflies and 100,000 nymphs belonging to 97 species were collected. Each species and the stations where they were found are listed. Comments are made where the nomenclature had changed or the identification seemed incorrect. This comprehensive investigation delineates the maximum range for each species, its distribution within the investigated area, and along specific water courses. Six different longitudinal zones were distinguished in the Sola, Skawica, Raba, and San catchments and the Dunajec and its tributaries from the Tatras and Groce, which were inhabited by five different mayfly nymph communities. They are identified as to species composition and dominance. The quantitative distribution of mayflies is indicated at five habitats in the River Raba catchment area at various seasons. (Buchanan-Davidson--Wisconsin)
W76-06216

THE RELATIONSHIPS OF PHOSPHORUS AND NITROGEN TO THE TROPHIC STATE OF NORTHEAST AND NORTH-CENTRAL LAKES AND RESERVOIRS.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Available from the National Technical Information Service, Springfield , Va 22161 as PB-240 937, $4.00 in paper copy, $2.25 in microfiche. Working Paper No. 23, December 1974. 40 p. 7 fig., 14 ref., 2 append. 1BA029

Descriptors: *Eutrophication, *Trophic level, *Phosphorus, *Nitrogen, Lakes, Northeast U.S., Chlorophyll, Nuisance algae, Secchi disks, Algae, Depth, Limiting factors, Nutrients, Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New York, Rhode Island, Vermont, Wisconsin.
Identifiers: *Phosphorus input guidelines, *North-central U.S., National Eutrophication Survey.

National Eutrophication Survey data collected during 1972-1973 from lakes and reservoirs in ten

northeast and north-central states were used to describe relationships between total phosphorus concentrations and chlorophyll in phosphorus-limited lakes, which were used to establish phosphorus guidelines (20-30 micrograms total phosphorus/l) to avoid nuisance phytoplankton blooms. Oligotrophic and mesotrophic lakes had chlorophyll concentrations less than 12 micrograms/l. Secchi disc readings (in eutrophic lakes) were less than 2 m, above 6.6 feet in mesotrophic lakes, and above 11.8 feet in oligotrophic lakes. Relationshipes between median fall total phosphorus concentrations and algal yields suggested a total phosphorus guideline of 25 micrograms/l to maintain algae-free conditions. Using Vollenweider's concept, total phosphorus loading guidelines were established for phosphorus-limited lakes and reservoirs. Loading limits were established for each lake based on mean depth and hydraulic retention time. A relationship deriving total nitrogen-loading guidelines for nitrogen-limited lakes was developed. All nitrogen-limited lakes studied were eutrophic, indicating that usually nitrogen-limitation does not occur until a lake is highly enriched. These guidelines plus knowledge of nutrient levels, land use, lake use, and lake morphometry can be used to establish enforceable nutrient criteria and to avoid nuisance algal bloom conditions. (Buchanan-Davidson--Wisconsin).
W76-06220

NATIONAL EUTROPHICATION SURVEY METHODS FOR LAKES SAMPLED IN 1972.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 936, $4.00 in paper copy, $2.25 in microfiche. Working Paper No. 1, October 1974. 44 p. 4 tab., append.
1BA029

Descriptors: *Eutrophication, *Surveys, *Sampling, *Analytical techniques, Chemical properties, On-site tests, Precipitation(Atmospheric), Streams, Sewage effluents, Septic tanks, Northeast U.S., Stream flow, Runoff, Drainage area, Lakes, Bioassay, Nutrients, Algae, Minnesota, Michigan, Wisconsin, New York, Connecticut, Massachusetts, Rhode Island, Delaware, New Hampshire, Maine.
Identifiers: *Nutrient sources, *National Eutrophication Survey, Selenastrum capricornutum, Nutrient loads.

The chemical, physical, and biological methods and other procedures used by the National Eutrophication Survey for studying lakes, streams, and municipal sewage treatment plant effluents in ten northeastern states are described. Estimates of streamflows and runoff for streams and drainage areas for each stream, lake or reservoir were made. Lake tributary and outlet nutrient loads were estimated for an average flow year. Using regression analysis, the results showed annual loading values generally within a few percent of the loading which would be estimated if it were assumed that nutrient concentrations did not vary with changes in stream flow. Usually 100% of point-source loads eventually reached the lake or reservoir. Nutrient contributions of unsampled portions of drainage areas were estimated by using the average nutrient export per unit area of sampled stream drainage and multiplying that by the area of the unsampled portion. When sewage plant effluents were not sampled, nutrient loads were estimated on the basis of 100 gallons/capita/day. Total phosphorus and nitrogen contributions were also estimated on a per capita/year basis. Algal assay tests were conducted with Selenastrum. Phytoplankton was identified and counted, and the most prevalent genera and total counts per ml were tabulated for each lake sampled. (Buchanan-Davidson--Wisconsin).
W76-06221

A METHOD OF DETERMINING MORPHOPHYSIOLOGICAL INDICATORS IN THE ECOLOGY OF ROTIFERS (ROTATORIA), (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W76-06231

A CONTINUOUS FLOW APPARATUS FOR THE CULTURE OF FILAMENTOUS GREEN ALGAE,
University Coll. of South Wales and Monmouthshire, Cardiff. Dept. of Botany.
N. B. Prance, and K. Benson-Evans.
Br Phycol J. 8(1): 59-63. Illus. 1973.

Descriptors: Algae, *Chlorophyta, *Cultures, Plant growth, *Experimental models.
Identifiers: Ulothrix-Zonata, Filamentous algae, Green algae.

An apparatus is described in which filamentous algae can be grown under conditions of continuous flow at river levels of nutrients and be harvested at the end of an experimental period. Details of a trial experiment involving the culture of Ulothrix zonata (Weber et Mohr) Kutz. are given.-Copyright 1974, Biological Abstracts,Inc.
W76-06244

OBSERVATIONS ON BLOOMS OF THE DINOFLAGELLATE GYRODINIUM AUREOLUM HULBURT IN THE RIVER CONWAY AND ITS OCCURRENCE ALONG THE NORTH WALES COAST,
Ministry of Agriculture, Fisheries and Food, Conway (Wales). Fisheries Experiment Station.
D. Ballantine, and F. M. Smith.
Br Phycol J. 8(3): 233-238. Illus. 1973.

Descriptors: Europe, *Dinoflagellates, *Flowering, Plant growth regulators, Eutrophication.
Identifiers: Blooms, Conway River, Dinoflagellate, Gyrodinium-Aureolum, Wales.

A water bloom was observed in the River Conway and along the North Wales coast in Oct. 1971. The course of the bloom was measured by counts and an investigation made of the distribution of the causative organism and its identification. It is considered to be G. aureolum Hulburt, though there are minor differences from the type.--Copyright 1974, Biological Abstracts, Inc.
W76-06245

PHYTOPLANKTON BIOMASS AND DISTRIBUTION IN A SHALLOW EUTROPHIC LAKE (LAKE GEORGE, UGANDA),
Vienna Univ. (Austria). Limnologische Lehrkanzel.
G. G. Ganf.
Oecologia (Berl). 16(1): 9-29. Illus. 1974.

Descriptors: *Phytoplankton, *Biomass, Lakes, *Eutrophication, Flow, Fluid movement, Africa.
Identifiers: Anabaena, Lake George, Melosira, Uganda, Water movement.

Lake George, a shallow lake in western Uganda, supports a permanent and dense crop of phytoplankton, and may be regarded as eutrophic although the ambient concentrations of inorganic N and P are low. The figures for the annual nutrient loadings (Viner andSmith, 1973) would suggest, however, a eutrophic lake when analyzed on the scheme of eutrophication proposed by Vollenweider (1968). The horizontal distribution of chlorophyll a shows a concentric pattern, with the maximum values occurring towards the center. This horizontal variation is thought to reflect water movements, and a general pattern of water flow is proposed. The majority of the species show no seasonal variation but populations of both Anabaena and Melosira show annual variations. These 2 spp. also have a horizontal distribution pattern which is the reverse of other species. This pattern is used to support that proposed movements of water. Phytoplankton generation times are discussed in relation to the diurnal cycle occurring in Lake George. --Copyright 1974, Biological Abstracts, Inc.
W76-06246

N AND P DISTRIBUTION IN LAKE KINNERET (ISRAEL) WITH EMPHASIS ON DISSOLVED ORGANIC NITROGEN,
Israel Oceanographic and Limnological Research Ltd., Haifa; and Kinneret Limnology Lab., Tiberias (Israel).
For primary bibliographic entry see Field 5B.
W76-06268

AN APPROACH TO A WATER QUALITY INDEX FOR CANADA,
Department of the Environment, Ottawa (Ontario). Science Policy Branch.
For primary bibliographic entry see Field 5G.
W76-06272

IMPACT OF THE SEWAGE WORKERS' STRIKE ON THE RIVER CLYDE,
Clyde River Purification Board, Glasgow(Scotland).
D. Hammerton.
Effluent and Water Treatment Journal, Vol. 15, No. 6, p 278-287, June 1975. 4 fig, 1 tab, 1 ref.

Descriptors: *Water quality, *Sewage treatment, *Sewage effluents, *Aeration, Pollution, Waste dilution, Flow augmentation, Oxygen demand, Aquatic populations, Water pollution effects.
Identifiers: *River Clyde(Scotland).

From October 7 to December 2, 1974, 120 workers at three Scottish sewage treatment plants went on strike and during that time about 450 megaliters per day of untreated liquid residuals were discharged into the River Clyde. The main concern was public health, that is, to see that sewers did not become overloaded and that crude sewage did not flow onto the streets. A major effort to monitor damage to water quality was made. In addition to obvious contamination at each sewage outfall there was a marked rise in suspended solids, ammonia and BOD values, with a resultant decrease in dissolved oxygen. In the middle of October oxygen declined rapidly but two days of heavy rainfall increased oxygen concentrations to very safe levels and averted a salmon kill. Two methods of aerating river water were tried on a small scale. Two oxygen injection units were capable of injecting from 1/2 to 1 and 1/2 tons of oxygen per day and were effective, but two floating aerator units did little, probably because the units did not mix water sufficiently. Impact on plants and animals was less than might be expected which emphasizes the fact that conditions on the bottom rather than those in the water determine the ability of life forms to survive. The river recovered in about six months. There was no real threat to public health during the strike because of relatively high water flows (but not high enough to flood streets fortunately), lowered water temperatures, and the fact that treatment plants and rivers were not affected where river water is used for recreation and water supply. Aquatic eco-systems can recover from severe or catastrophic short-term pollution much more rapidly than from lower levels of chronic pollution. (Smith - North Carolina)
W76-06281

PRODUCTION OF PLANKTONIC CRUSTACEANS OF TWO SECONDARY OLIGOTROPHIC LAKES, (IN RUSSIAN),
Gorki State Univ. (USSR).
M. A. Petrova, T. S. Elagina, V. K. Spiridonov, and T. A. Filatkina.
Gidrobiol Zh 11(1), p 82-86. 1975.

Descriptors: *Production, *Crustaceans, Plankton, Lakes, *Oligotrophy, Biomass, Daphnia, Entrophication, Water pollution effects.
Identifiers: Bosmina-Coregoni, Bosmina-Kessleri, Daphnia-Longispina, Diaphanosoma-Brachyurum, Diaptomus-Gracilis, Mesocyclops-Leuckarti, *USSR.

Two lakes, 1 in the NE and the other in SW of the Gorki Oblast of the Russion SFSR (USSR) were studied. Morphometric indices of the lakes, and the numbers, absolute and relative biomass, fecundity, size and duration of development, production (P), biomass (B) and P/B ratios of crustaceans (Diaptomus gracilis, Daphnia longispina, Mesocyclops leuckarti, Bosmina coregoni, B. kessleri and Diaphanosoma brachyurum) in these lakes are presented.--Copyright 1975, Biological Abstracts, Inc.
W76-06301

CHLORINATION IN DILUTE AQUEOUS SYSTEMS; 2,4,6-TRICHLOROPHENOL,
Waterloo Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-06306

SIGNIFICANCE OF TRACE METALS AND NITRATES IN SLUDGE SOILS,
Environmental Protection Agency, Columbus, Ohio. Div. of Waste Management and Engineering.
For primary bibliographic entry see Field 5E.
W76-06307

HYDROLOGICAL AND HYDROGEOLOGICAL ASSESSMENT OF LANDFILL SITES,
For primary bibliographic entry see Field 5E.
W76-06315

STAGONOSPORA FOLICOLA, A PATHOGEN OF REED CANARYGRASS SPRAY-IRRIGATED WITH MUNICIPAL SEWAGE EFFLUENT,
Agricultural Research Service, University Park, Pa. Regional Pasture Research Lab.
For primary bibliographic entry see Field 5E.
W76-06318

HEALTH SIGNIFICANCE OF AIRBORNE MICROORGANISMS FROM WASTEWATER TREATMENT PROCESSES, PART I: SUMMARY OF INVESTIGATIONS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
J. L. S. Hickey, and P. C. Reist.
Journal Water Pollution Control Federation, Vol. 47, No. 12, p 2741-2757, December, 1975. 54 ref.

Descriptors: *Public health, *Aerosols, *Treatment facilities, Bacteria, Pathogenic bacteria, Coliforms, Air pollution effects, Path of pollutants, Reviews, Microorganisms.
Identifiers: Air pollution sources, Aerated waste water treatment.

This report summarizes 16 published reports representing 13 separate field studies, all that could be found in English, of airborne microorganisms from waste water treatment processes. The earlier studies, from 1907 to the 1950's, established that bacteria was spread by aerosolization from waste water flowing in sewers, sludge aeration tanks, and trickling filters. In 1966, it was shown that trickling filters yielded twice as many coliforms as other plant units, and that half the particles were less than 5 microns in diameter. In a different test, it was calculated that this particle size could penetrate the lungs and that the number of small particles increased with some distance from the waste water sources. Later it was decided that the small aerosols could penetrate both the bronchia and the upper respiratory tract. Aerosol dispersion patterns, taking into consideration the direction of wind, were made. In 1973, a test was undertaken in which bacteria were recovered from various airs around a plant and guinea pigs were inoculated with the organisms. Within 6 weeks the guinea pigs developed lesions. Another study concluded that solar radiation, low relative humidity, and low wind speed reduced aerosol emissions. One report suggested that coliforms may not be a reliable index of air pollution arising from waste water aeration and that total colony count may be a more accurate measure. Some of the reports made conclusions about possible health hazards, but the totality of the significances on health are summarized in the second part of the article. (See also W76-06327) (Loustau-FIRL)
W76-06326

HEALTH SIGNIFICANCE OF AIRBORNE MICROORGANISMS FROM WASTE WATER TREATMENT PROCESSES, PART II: HEALTH SIGNIFICANCE AND ALTERNATIVES FOR ACTION,
North Carolina Univ., Chapel Hill. Dept. of Environmental Science and Engineering.
J. L. S. Hickey, and P. C. Reist.
Journal Water Pollution Control Federation, Vol. 47, No. 12, p 2758-2773, December, 1975. 4 tab, 77 ref.

Descriptors: *Public health, *Treatment facilities, *Aerosols, Bacteria, Pathogenic bacteria, Path of pollutants, *Air pollution effects, Microorganisms.
Identifiers: Aerated waste water treatment, Air pollution sources.

The emission and spread of viable bacterial aerosols from aerated waste water processes has been demonstrated in numerous studies. These aerosols contain a variety of virulent, pathogenic, bacterial genera and species in particles within the human respirable size range for both upper and lower respiratory tract deposition. Present evidence does not, however, confirm or negate the existence of a health risk. Further investigation of health effects is necessary, and concurrent development and evaluation of viable aerosol control measures could be helpful. Environmental monitoring is not of much value without further studies on the health aspects of aerosols. Nonetheless, waste water plant operators and health professionals should be informed of the potential risks from waste water aerosols. These conclusions were drawn from an overall assessment of the results and conclusions of studies into the airborne microorganisms. The studies included field and laboratory investigations, reviews, and surveys from 1907 to 1975. (See also W76-06326) (Loustau-FIRL)
W76-06327

NUTRITIONAL AND PHYSIOLOGICAL EFFECTS OF NITRATES, NITRITES, AND NITROSAMINES,
Florida Univ., Gainesville. Dept. of Animal Science.
R. L. Shirley.
BioScience, Vol. 25, No. 12, p 789-794, December, 1975. 81 ref.

Descriptors: *Septic tanks, *Waste water treatment, *Fertilizer, *Sewage treatment, *Lakes, Nitrates, Nitrites, Eutrophication, Toxicity, Potable water, Animal diseases.
Identifiers: Nitrosamines, Carcinogens.

Areas of high concentrations of livestock, heavy fertilizer application, septic tanks, and dewage plant outflow may produce excessive quantities of nitrates in animals' drinking water and eutrophication of lakes. Nitrates and nitrites consumed in diets of animals are being studied as toxic factors for the animals. Ruminants have greater tolerance of nitrate and nitrite than human infants, but a potential danger still exists. Nitrates have been demonstrated to lessen formation of toxins when added to meat products that contain various toxin-producing microbes. On the other hand, in the presence of various amines in meat and other foodstuffs, nitrites have been demonstrated to produce carcinogenic nitrosamines. Bacteria in the alimentary tract produce nitrosamines from nitrite and amines derived from lecithin and proline. Because experimental doses exceed the concentrations that normally appear, it is not known whether the potential sources of nitrosamines have actually produced cancer in animals. Tests on rats showed that nitrosamines produced cancer in the digestive, urinary, and respiratory tracts, as well as in the liver and reproductive tissues. (Loustau-FIRL)
W76-06334

EFFECTS OF SALINITY ON NITRIFICATION IN THE EAST RIVER,
New York State Dept. of Health, Albany. Div. of Labs. and Research; New York State Dept. of Health Albany. Environmental Health Center.
M. Chen, E. Canelli, and G. W. Fuhs.
Journal Water Pollution Control Federation, Vol. 47, No. 110, p 2474-2481, October, 1975. 3 fig, 3 tab, 25 ref.

Descriptors: *Ammonia, *Nitrites, *Waste water treatment, *Nitrification, *New York, Sampling, Bacteria, Rivers, *Salinity, Environmental effects, Chemical analysis, Waste assimilative capacity.
Identifiers: East River(NY).

Due to known high concentrations of ammonia and nitrite from discharges of waste water treatment plants into New York Harbor, a study was done to determine the rate of nitrification in the East River and to determine the NaCl tolerance of the nitrifying bacteria. Water samples were collected from 12 sites along the East River each week for about three months. Media were prepared with the river dilutions to represent the concentrations of calcium, magnesium, phosphorus, and iron in the undiluted East River water. The samples were incubated for 20 days and then portions were used as inocula. Colonies were selected and streaked twice for isolation. The results of chemical analysis showed that the rates of nitrification in samples from the East River are increased when the sampls are diluted with suitable media prepared with distilled water. The rates of nitrification in samples from the southern or central parts of the East River are higher than those in samples near the sound. Both NaCl and some unknown substances in the filtrate portion of the water seem to inhibit nitrification in the East River. Nitrifying bacteria isolated from the East River were not halophilic. Most nitrifying bacteria in the East River are therefore apparently of terrestrial origin. (Loustau-FIRL)
W76-06335

RELATIONSHIP BETWEEN VARIOUS BACTERIAL POPULATIONS AND COPROSTANOL AND CHOLESTEROL,
Canada Centre for Inland Waters, Burlington (Ontario).
B. J. Dutka, and A. El-Shaarawi.
Canadian Journal of Microbiology, Vol. 21, No. 9, p 1386-1398, September, 1975. 3 fig, 9 tab, 19 ref.

Descriptors: *Viruses, *Model studies, *Coliforms, *Bacteria, *Public health, Treatment facilities, Flocculation, Sampling, Statistical analysis.
Identifiers: *Coprostanol, *Cholesterol.

Since fecal matter in water can carry hazardous viruses, finding traces of coprostanol and cholesterol in raw waters, indicating the presence of fecal matter in water, could be important to public health. A one-year study evaluated the relationship between coliforms, fecal coliforms, fecal streptococci, heterotrophs, and coprostanol and cholesterol. Sewage samples were collected from

four treatment plants, one that chlorinated clarifier effluent, one that chlorinated water before flocculation and added lime to the clarifier tank, one that chlorinated final effluent, and one that chlorinated raw sewage. Water samples were analyzed bacteriologically, and fecal sterol samples were analyzed chemically. Reduction in fecal-sterol levels ranged from 46.93% to 99.81%. A significant relationship existed between coprostanol and cholesterol in all three phases of the sewage-treatment processes. No significant relationships were found to exist between fecal sterols and bacterial parameters in the raw-sewage streams. However, in treated unchlorinated sewage a significant relationship was observed between most bacterial parameters and fecal sterols. A statistical model using the collected data indicated that coprostanol and cholesterol have a high positive correlation, thus supporting the concept that either sterol could be used as an indicator of fecal pollution. (Loustau-FIRL)
W76-06336

USE OF SEWAGE SLUDGE ON AGRICULTURAL LAND AND THE EFFECTS OF METALS ON CROPS,
Agricultural Development and Advisory Service, Wolverhampton (England).
J. H. Williams.
Water Pollution Control, Vol. 74, No. 6, p 635-644, 1975. 10 tab, 7 ref.

Descriptors: *Sewage sludge, *Nitrogen, *Phosphate, *Fertilizer, Toxicity, Heavy metals, Soils, Zinc, Nickel, Copper, Lead, Mercury, Cadmium, Environmental effects, Industrial wastes.
Identifiers: Land application.

Sewage sludges, and particularly liquid digested sludges, are valuable sources of available nitrogen and phosphate, if they are applied in spring when the growing crop can utilize them. Sewage sludge containing industrial wastes must be applied carefully, and sludges that may be toxic are unsuitable for agricultural use. Once a harmful concentration of these toxic metals is built up in soils, the effect can be permanent. Zinc and nickel are absorbed by plant roots and translocated within the plant. Copper becomes concentrated in the roots. Very little of the total lead in the soil is absorbed by plants and it remains in the roots; although it does not seem to affect plant growth, it could harm animals or humans if abnormal amounts are accumulated. Although not enough is known about the behavior of mercury and cadmium, cadmium probably is a risk because it is readily taken up by the roots, and mercury probably is not because its percentage in sludge is so small. (Loustau-FIRL)
W76-06339

REVEGETATING BITUMINOUS STRIP-MINE SPOILS WITH MUNICIPAL WASTEWATER, PART II: QUALITY THE LEACHEATE AND SPOIL CHEMICAL CHANGES,
Pennsylvania State Univ., University Park. Dept. of Forest Hydrology.
For primary bibliographic entry see Field 5D.
W76-06343

EXAMINATION OF SEWAGE AND SEWAGE SLUDGE FOR ENTEROVIRUSES, VOLUME 1.
Ontario Ministry of Health, Toronto.
For primary bibliographic entry see Field 5A.
W76-06371

NUTRIENT TRANSFORMATIONS IN MASS CULTURES OF MARINE ALGAE,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
J. C. Goldman, and J. H. Ryther.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. EE3, Proceedings paper No. 11358, p 351-364, June 1965. 8 fig, 2 tab, 22 ref.

Descriptors: *Algae, *Marine algae, *Environmental engineering, *Nutrients, Ammonia, Geographical regions, Nitrogen, Phosphorus, Sea water, Waste water(Pollution).
Identifiers: *Algal nutrients.

Two mass cultures of marine algai were maintained for 24 continuous weeks on mixtures of secondarily treated wastewater and seawater. Nitrogen removal and algal growth were related to both nitrogen loading in the form of variations in the waste-seawater mixture and changes in the dilution rate. Nitrogen assimilation was limited to about 4 mg/1. High nitrogen removals were associated with a combination of algal assimilation and ammonia evolution at the high pond pH values attained. Algal concentrations represented as both particulate carbon (PC) and particulate nitrogen (PN) decreased linearly with increases in the dilution rate. Maximum algal yields of 6 g PC m-2 day-1 occurred at a dilution rate of 0.75 day-1. (Bell-Cornell)
W76-06441

ACROLEIN RESIDUES IN IRRIGATION WATER AND EFFECTS ON RAINBOW TROUT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
T. R. Bartley, and A. R. Hattrup.
Report REC-ERC-75-8, May 1975. 13 p, 3 fig, 5 tab, 11 ref.

Descriptors: *Herbicides, Aquatic, Weed control, Irrigation systems, *Rainbow trout, Mortality, Analysis, Water samples, Treatment, Washington, Pesticide residues, Columbia River, Irrigation water.
Identifiers: Columbia Basin Project(WA), *Acrolein.

Studies were conducted on the Columbia Basin Project, Washington, to determine the concentrations of acrolein in irrigation water at several sampling stations during 20 applications of the herbicide for aquatic weed control and at the Bureau of Reclamation's Carter Lake, Colorado Aquatic Weed Test Station to find the effects of simulated acrolein treatment on rainbow trout. Analysis of samples of treated irrigation water shows that the actual acrolein concentrations near application sites agree with the computed levels and that the concentrations decline gradually as the treated water moves downstream. Applications of about 0.1 p/m for 48 hours with one booster application require a distance of 30 to 40 miles (48.3 to 64.4 km) to reduce concentration to the 0.02 p/m level. Acrolein concentrations used for aquatic weed control are toxic to rainbow trout. Acrolein concentrations of 0.2 and 0.02 p/m for exposure periods of 4.8 and 48 hours respectively, are levels considered to be reasonably safe to trout. (Burea of Reclamation)
W76-06563

THE GREEN BAY WATERSHED - PAST/PRESENT/FUTURE,
Wisconsin Univ., Madison Inst. for Environmental Studies.
G. Bertrand, J. Lang, and J. Ross.
Report WIS-SG-76-229; January 1976, 319 p.

Descriptors: *Environment, *Ecology, *Ecosystems, *Lake Michigan, Aquatic environment, Biological communities, Water pollution, Water quality, *Wisconsin, Michigan, Bays, Natural resources, Water pollution effects.
Identifiers: *Green Bay watershed(Wisc), Green Bay ecosystem(Wisc), Resources use, Pollution control.

Green Bay is a major geographic feature of Wisconsin and Michigan. It is a significant natural resource. It is a recreation area, a fishery, a commercial waterway, and it contains a highly productive biological system. Since the time of settlement, 150 years ago, the Green Bay system has been changed drastically. The changes are largely the result of two major activities: (1) heavy use of resources in the region; and (2) use of the surface water as a pollution sink, causing a progression of poor quality water up the bay from south to north as time goes on. The interaction of resource use and pollution has caused a depletion of natural resources, including some that would have the capacity to renew themselves under less stress. But it has also vastly changed the population dynamics of an array of living species in the bay. It is possible that a critical point of change is being reached in the condition of Green Bay. (NOAA)
W76-06569

SUMMARY AND CONCLUSIONS: NUTRIENT TRANSPORT AND ACCOUNTABILITY IN THE LOWER SUSQUEHANNA RIVER BASIN,
Environmental Protection Agency , Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 5B.
W76-06575

EFFECT OF SALINIZATION ON CERTAIN SOIL MICROFLORA,
Institute for Applied Research on Natural Resources, Baghdad(Iraq).
A. N. Yousef, S. M. Damirji, I. J. Al-Khalili, and A. M. Al-Zubar.
Technical Bulletin 83, August, 1975. 27 p, 6 fig, 9 tab, 18 ref.

Descriptors: *Saline soils, *Clostridium, *Nitrogen fixing bacteria, *Sulfur bacteria, *Azotobacter, Salinity, Salts, Sulfates, Saline water, Soil microorganisms, Soil bacteria, Nitrification, Soil analysis, Salt tolerance, Fertility.
Identifiers: *Al-Dalmag province(Iraq).

The effect of soil salinity was studied on total microbial count, non-symbiotic nitrogen-fixing Azotobacter and clostridia, nitrifiers, and sulfate reducing bacteria. Three treatments were prepared: non-saline soil supplied with distilled water, non-saline soil supplied with saline groundwater, and saline soil supplied with distilled water. Soil samples were analyzed at 45-day intervals for one year from 0-30 and 30-60 cm depths. In the non-saline and saline soils supplied with distilled water, most of the salts accumulated within the first sampling intervals in the 0-30 cm layer. Salts accumulated gradually in both layers for the non-saline soil supplied with saline groundwater. The effect of salts on soil microflora depends on the quantity and quality of the salts. Azotobacter and the nitrifiers were more affected by salinization than the clostridia. The number of sulfate reducers for all treatments was higher in the 30-60 cm layer. The total microbial count and the count of other bacteria groups showed no marked difference in the upper and lower layers. When salt accumulated in the upper layers, the counts were greater in the lower layers. (Robinett-Arizona)
W76-06582

THE MEDICINE BOW ECOLOGY PROJECT: THE POTENTIAL SENSITIVITY OF VARIOUS ECOSYSTEM COMPONENTS TO WINTER PRECIPITATION MANAGEMENT IN THE MEDICINE BOW MOUNTAINS, WYOMING,
Wyoming Univ., Laramie.
D. H. Knight.
February 28, 1975, 397 p. 14-06-D-7198

Descriptors: Baseline studies, *Cloud seeding, Ecology, Ecosystems, *Wyoming, *Weather modification, Forests, Hydrographs, Silver iodide, Snowmelt, Snow management, Toxicity, Deer, Elk, Fish, Aquatic animals, Aquatic algae, Trout, Vegetation.
Identifiers: *Medicine Bow Ecology Project(Wyo).

In addition to baseline data, the Report includes (1) the results of studies on the impact of snow on

herbaceous and shrubby vegetation, elk, deer, trout, lake phytoplankton, and litter decomposition; and (2) the movement of Ag in an alpine ecosystem, the natural concentration of Ag at 20 locations in the Mountains, and the toxicity of Ag to tufted hairgrass, lodgepole pine seedlings, and rainbow trout. Ecological changes resulting from cloud seeding probably will be very slow, assuming that annual snowfall will be increased by only about 15 percent and only above about 2700 m elevation, and that snow cover duration will be prolonged by only a few days, if at all. The general discussion emphasizes the need for accurate information on the amount, distribution, and duration of the additional snow produced by cloud seeding in order to accurately evaluate impact; the fact that cloud seeding will be but one of several human influences on the ecosystems; and that there is the potential for indirect, undesirable impacts on areas downstream from where the seeding occurs. Six recommendations are listed that seem desirable from an ecological perspective, and information gaps are identified. (Bureau of Reclamation)
W76-06610

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING 'AS LOW AS PRACTICABLE' GUIDES--APPENDIX A. PREPARATION OF COST ESTIMATES FOR VOLUME 1, MILLING OF URANIUM ORES,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5D.
W76-06614

WATER QUALITY MODEL FOR SMALL AGRICULTURAL WATERSHED,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5B.
W76-06641

TAXONOMY OF KLEBSIELLA PNEUMONIAE ISOLATED FROM PULP/PAPER MILL WASTEWATER,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
M. D. Knittel.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-244 405, $4.00 in paper copy, $2.25 in microfiche. Report EPA-660/2-75-024, June 1975. 31 p, 6 fig, 7 tab, 22 ref. 1BB037.

Descriptors: *Microbiology, Isolation, *Pulp wastes, Cultures, Classification, *Systematics, Chemical reactions, Pollutant identification.
Identifiers: *Klebsiella pneumoniae, *DNA.

K. pneumoniae isolated from pulp mills was compared to clinical isolates of K. pneumoniae. Cultures were identical in biochemical reaction in various media and conformed to the recognized schemes of classification of K. pneumoniae. Nucleic acid base composition comparison of these isolates showed that all exhibited a G+C% base composition of 56%+ or minus 1.4%, and all cultures examined fell within this range. A study of the heterologous binding capability between DNAs of these cultures revealed that isolates from both the environment and pathogenic reference had a base sequence from 80 to 100% in common. This confirms the earlier results that pulp mill isolates are the same as clinical isolates. (EPA)
W76-06645

AN ASSESSMENT OF THE EXPECTED IMPACT OF A DREDGING PROJECT PROPOSED FOR PALA LAGOON, AMERICAN SAMOA,
Hawaii Univ., Honolulu. Sea Grant Program.
For primary bibliographic entry see Field 6G.
W76-06654

BIOSTIMULATION AND NUTRIENT ASSESSMENT.
Utah Water Research Lab., Logan.
Workshop proceedings PRWG168-1, September 10-12, 1975, Water Research Laboratory, Utah State Univ., Logan, November 1975. Edited by E. J. Middlebrooks, D. H. Falkenborg, and T. E. Maloney. 396 p. R-903523 01.

Descriptors: *Algae, *Bioassay, *Analytical techniques, Growth rates, Nutrient requirements, Laboratory tests, Eutrophication, Toxicity, Limiting factors, Cultures, Model studies, Sampling, Biomass, Waste water(Pollution), Dredging, Anabaena, Water analysis, Management, Sediment-water interfaces, Sediments, Ecosystems, Hardness(Water), Phosphorus, Disposal, Lakes.
Identifiers: *Algal Assay Procedure, *Algal growth potential, *Selenastrum capricornutum, Anabaena flos-aquae.

The application of the Algal Assay Procedure: Bottle Test and its modifications are discussed in relation to various ecological and environmental variables. Contributions focus on the application of the test in biostimulation and toxicity testing; field evaluation of the test on surface waters of North Carolina; its application to define the effects of wastewater effluents upon algal growth in multiple use river systems; and the relationship of laboratory algal assays to measurement of indigenous phytoplankton in Long Lake, Washington. The test's applicability to compare algal growth responses of Selenastrum capricornutum and Anabaena flos-aquae in waters collected from Shagawa Lake, Minnesota; seasonal variation of algal biomass production potential and nutrient limitation in Yaquina Bay, Oregon; and algal nutritional bioassays of Lake Wylie, North Carolina, is described. Nutrient assessments as a basis for lake management priorities, as applied to Wisconsin lakes, is reviewed. Other contributions compare semi-continuous and continuous flow bioassays; the effects of media modifications upon S. capricornutum in batch cultures; sediment-water microcosms designed for assessment of nutrient interactions; effects of water hardness, phosphorus concentration and sample pretreatment on the test; and a elutriate method to determine the significance of dredged material disposal in open waters. (See W76-06697 thru W76-06709) (Auen-Wisconsin).
W76-06696

APPLICATION OF THE ALGAL ASSAY PROCEDURE IN BIOSTIMULATION AND TOXICITY TESTING,
Procter and Gamble Co., Cincinnati, Ohio.
A. G. Payne.
In: 'Biostimulation and Nutrient Assessment,' (PRWG168-1), workshop proceedings September 10-12, 1975, Logan, Utah, Water Research Laboratory, Utah State Univ., Logan, November 1975. p. 3-27. 18 fig, 10 ref.

Descriptors: *Eutrophication, *Algae, *Bioassay, *Analytical techniques, Algicides, Trace elements, Lethal limit, Growth rates, Cultures, Measurement, Laboratory tests, Standing crops, Chelation, Sewage effluents, Zinc.
Identifiers: *Algal Assay Procedure, *Algal growth potential, Microcystis aeruginosa.

The Algal Assay Procedure combined with physical and chemical measurements is a dependable method to assess algal growth potential and show differences in nutrient concentrations between seasons. When oligotrophic water samples were filtered, inoculated, and maintained under laboratory conditions, they supported low algal standing crops all year. Natural populations of these waters also remained low all year. Eutrophic waters in winter supported high maximum standing crops of test algae and high natural populations in spring. The Algal Assay Procedure indicated the relative chelating capacity of synthetic compounds, sewage effluent, and natural chelators in aquatic environments. Laboratory-cultured Microcystis aeruginosa's sensitivity to low free metal levels is used in trace metal/chelator studies. Because the zinc level is close to the Microcystis toxicity level in Algal Assay Procedure media, it should be lowered for optimizing Microcystis growth. The method can also be used to determine algal toxicity of test materials. Results expressed in terms of minimum algistatic concentration after five days represent the test material level which does not cause net changes in test algae populations after chronic exposure, causes primary inhibitory effects at the cellular level, but does not cause permanent or irreversible damage to test cultures. (See also W76-06696) (Buchanan-Davidson--Wisconsin).
W76-06697

FIELD EVALUATION OF THE ALGAL ASSAY PROCEDURE ON SURFACE WATERS OF NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
C. M. Weiss.
In: 'Biostimulation and Nutrient Assessment,' (PRWG168-1), workshop proceedings September 10-12, 1975, Logan, Utah, Water Research Laboratory, Utah State Univ., Logan, November 1975, p 29-76. 1 fig, 34 tab, 11 ref.

Descriptors: *Eutrophication, *Algae, *Bioassay, *Analytical techniques, Growth rates, Measurement, On-site investigations, Trophic level, Laboratory tests, Nitrogen, Chlorophyll, Productivity, Phosphorus, Autoclaves, Filtration, Deficient elements, Biomass, Limiting factors, North Carolina.
Identifiers: *Algal Assay Procedure, *Algal growth potential, Selenastrum capricornutum.

To establish relationships between assays and existing trophic levels of water bodies, algal assays were made of 44 North Carolina water bodies. Cell density decreased with inorganic nitrogen increase; chlorophyll remained relatively constant; productivity reached a peak in middle concentration ranges. In the growing season soluble nitrogen showed an inverse relationship between cell number and nutrients. Phosphorus values varied but were higher in winter. Chlorophyll showed a positive relationship to cell density, productivity, and nitrogen. In the growing season there was a parallel increase in organic nitrogen and soluble phosphorus and increased productivity, cell density, and chlorophyll. Selenastrum capricornutum growth after autoclaving or filtering water samples indicated total and ambient growth potentials, respectively. Growth responses to added phosphorus or nitrogen compared to growth with original nutrient levels indicated nitrogen/phosphorus ranges. Soluble nitrogen/phosphorus determinations following limitation of either or both nutrients indicated that the ratio can define which nutrient is limiting for a particular water body. The standard assay procedure should be modified to limit the determination to biomass grown in reseeded samples after autoclaving and filtration. Whether a sample is limited in growth potential by the relative quantity of phosphorus or nitrogen can be determined from the total soluble nitrogen/phosphorus ratio. (See also W76-06696) (Buchanan-Davidson--Wisconsin).
W76-06698

APPLICATION OF ALGAL ASSAYS TO DEFINE THE EFFECTS OF WASTEWATER EFFLUENTS UPON ALGAL GROWTH IN MULTIPLE USE RIVER SYSTEMS,
Pacific Northwest Environmental Research Laboratory, Corvallis, Oreg. Eutrophication and Lake Restoration Branch.
W. E. Miller, J. C. Greene, and T. Shiroyama.
In: 'Biostimulation and Nutrient Assessment,' (PRWG168-1), workshop proceedings September 10-12, 1975, Logan, Utah, Water Research

Laboratory, Utah State Univ., Logan, November 1975, p. 77-92. 9 fig, 11 ref.

Descriptors: *Eutrophication, *Algae, *Rivers, *Bioassay, *Analytical techniques, *Growth rates, Washington, Laboratory tests, Effluents, Waste water(Pollution), Toxicity, Phosphorus, Trophic level, Trace elements, Nitrogen compounds, Limiting factors, Heavy metals, Zinc.
Identifiers: *Algal growth potential, *Algal Assay Procedure, *Spokane River system(Wash), Selenastrum capricornutum.

To define effects of domestic and industrial waste discharges on algal growth in the Spokane River system, Washington, the design and interpretation of laboratory algal assays is discussed. Algal responses to nitrogen and phosphorus limitations, trace element deficiency, and heavy metal toxicity were determined. The critical nitrogen:phosphorus ratio to support Selenastrum capricornutum was 11.3:1 micrograms. This ratio can assess algal growth limitations in natural waters. Waters with N:P ratios less than 10 are considered nitrogen-limiting while waters with N:P ratios above 10 may be phosphorus-limiting for algal growth. Correlation of algal assays with yields predicted from N:P ratios depend on the reliability of test procedure. Total soluble inorganic nitrogen (nitrite + nitrate + ammonia) and orthophosphate concentrations or availability in samples were calculated by dividing maximum assay yields by the total soluble inorganic nitrogen or orthophosphate yield coefficient. That samples do not attain the predicted assay yield or nutrient limitation status may be due to growth-limiting nutrients other than nitrogen or phosphorus, presence of toxic materials, or unreliable chemical determinations of orthophosphate and total soluble inorganic nitrogen. Addition of EDTA before assay can help determine nutrient enrichment problems in river systems receiving heavy metal wastes. (See also W76-06696) (Buchanan-Davidson--Wisconsin).
W76-06699

THE RELATIONSHIP OF LABORATORY ALGAL ASSAYS TO MEASUREMENTS OF INDIGENOUS PHYTOPLANKTON IN LONG LAKE, WASHINGTON,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg. Eutrophication and Lake Restoration Branch.
J. C. Greene, R. A. Soltero, W. E. Miller, A. F. Gasperino, and T. Shiroyama.
In: 'Biostimulation and Nutrient Assessment,' (PRWG168-1), workshop proceedings September 10-12, 1975, Logan Utah, Water Research Laboratory, Utah State Univ., Logan, November 1975, p. 93-126. 17 fig, 7 tab, 30 ref.

Descriptors: *Eutrophication, *Algae, *On-site tests, *Bioassay, *Analytical techniques, Washington, Water pollution, Reservoirs, Growth rates, Heavy metals, Autoclaves, Filtration, Zinc, Chemical analysis, Lake morphology, Laboratory tests, Phosphorus compounds, Nitrogen compounds, Nutrients, Limiting factors, Mixing, Hydrologic aspects, Biomass, Chlorophyll, Standing crops.
Identifiers: *Algal growth potential, *Algal Assay Procedure, Long Lake(Wash), Selenastrum capricornutum.

To determine if laboratory algal assays of natural waters actually reflect environmental conditions, studies were made of Selenastrum capricornutum growth potential on autoclaved and filtered water from Long Lake, Washington. Increased algal yields in EDTA spiked test waters showed toxic levels of heavy metal(s). Maximum algal yields were more than twice the minimum biomass level indicating highly eutrophic water. Samples were primarily phosphorus-limited, but sometimes the reservoir was limited so closely by both nitrogen and phosphorus that the primary limiting nutrient could not be determined. Samples collected after an underflow destroyed thermal and chemical stratification and induced extensive vertical mixing would not support algal growth in control or EDTA spiked samples; indigenous phytoplankton contained approximately half the normal chlorophyll concentration/unit volume. Correlation was high between indigenous phytoplankton and S. capricornutum dry weight if consideration was given to whether the reservoir was stratified or homothermal. An equation was developed to predict mean indigenous phytoplankton standing crops. If the reservoir is homothermal, the equation is useful to determine approximate indigenous phytoplankton standing crop at time of sampling; if stratified, it indicates the phytoplankton standing crop which was present approximately two weeks earlier. Another equation was developed to predict chlorophyll concentrations. (See also W76-06696) (Buchanan-Davidson--Wisconsin).
W76-06700

COMPARISON OF THE ALGAL GROWTH RESPONSES OF SELENASTRUM CAPRICORNUTUM PRINTZ AND ANABAENA FLOS-AQUAE (LYNGB.) DE BREBISSON IN WATERS COLLECTED FROM SHAGAWA LAKE, MINNESOTA,
Pacific Northwest Environmental Research Laboratory, Corvallis, Oreg. Eutrophication and Lake Restoration Branch.
T. Shiroyama, W. E. Miller, and J. C. Greene.
In: 'Biostimulation and Nutrient Assessment,' (PRWG168-1), workshop proceedings September 10-12, 1975, Logan, Utah, Water Research Laboratory, Utah State Univ., Logan, November 1975, p. 127-148. 10 fig., 4 tab., 22 ref.

Descriptors: *Eutrophication, *Algae, *Bioassay, *Growth rates, *Anabaena, *Laboratory tests, Minnesota, Cultures, Analytical techniques, Phosphorus, Nitrogen, Inhibitors.
Identifiers: *Algal growth potential, *Algal Assay Procedure, Selenastrum capricornutum, Shagawa Lake(Minn.), Anabaena flos-aquae.

The growth response of Anabaena flos-aquae was studied to determine its reliability as a test alga and to compare its growth response to that of Selenastrum capricornutum in water samples from Shagawa Lake, Minnesota. Results showed that A. flos-aquae can be used as a test organism to define growth potential and nutrient status of lake waters. For counting, sonication was more efficient than blending to fragment A. flos-aquae, but it damaged cells so cannot be used to prepare an inoculum. Water containing more than 0.010 mg/l orthophosphate yielded 0.45 mg/l dry weight A. flos-aquae per 0.001 mg/l phosphorus. Filtered and autoclaved-filtered water samples were primarily nitrogen-limited for S. capricornutum support. The A. flos-aquae growth response indicated constituents other than nitrogen and phosphorus limited its growth in filtered samples; addition of phosphorus stimulated growth to the maximum predicted values in autoclaved-filtered samples. Comparative analysis of algal growth responses suggested that more than one test species should be used to determine the growth potential or nutritional status of a test water, if the presence of a biologically produced toxin is suspected. Filtered and autoclaved-filtered samples must be analyzed to determine the presence of a biologically produced growth-inhibitor. (See also W76-06696) (Buchanan-Davidson--Wisconsin).
W76-06701

SEASONAL VARIATION OF ALGAL BIOMASS PRODUCTION POTENTIAL AND NUTRIENT LIMITATION IN YAQUINA BAY, OREGON,
Pacific Northwest Environmental Research Laboratory, Corvallis, Oreg. Eutrophication and Lake Restoration Branch.
D. T. Specht.
In: 'Biostimulation and Nutrient Assessment,' (PRWG168-1), workshop proceedings September 10-12, 1975, Logan, Utah, Water Research Laboratory, Utah State Univ., Logan, November 1975, p. 149-174. 4 fig., 16 tab., 23 ref.

Descriptors: *Bioassay, *Eutrophication, *Estuaries, *Seasonal, Algae, Laboratory tests, Oregon, Biomass, Sea water, Growth rates, Toxicity, Hydrologic aspects, Precipitation(Atmospheric), Phosphorus, Nitrogen, Sewage effluents, Pollutants.
Identifiers: *Algal Assay Procedure, *Algal growth potential, Yaquina Bay(Ore.), Dunaliella tertiolecta, Thalassiosira pseudonana, Selenastrum capricornutum.

Characteristics of Yaquina estuary that change its potential nutrient limitation were studied using Dunaliella tertiolecta, Thalassiosira pseudonana, and Selenastrum capricornutum as test organisms. Although euryhaline in nature, Dunaliella and Thalassiosira did not produce substantial growth in some water samples. Selenastrum studies showed that the waters were not algicidal or algistatic because of a toxic substance, but lacked the salinity necessary for effective growth. Selenastrum could be used for qualitative bioassay of estuarine waters with salinities up to 6% but not above 9%. Dunaliella responded reliably to addition of limiting nutrients at salinities as low as 5%. The potential nutrient limitation and biomass potential in the Yaquina estuary changed with hydrological and precipitation changes associated with seasonal cycles. The estuary showed maximum sensitivity to addition of nutritive wastes in late spring and summer months when light and temperature potentials were highest, permitting maximum use of nutrients by algae. Bioassays showed that addition of either phosphorus or nitrogen or both could stimulate algal growth depending on point of introduction, season, or time of day. Removal of both phosphorus and nitrogen from sewage effluents or other pollutant sources before disposal into estuaries or their tributaries should be seriously considered. (See also W76-06696) (Buchanan-Davidson--Wisconsin).
W76-06702

ALGAL NUTRITIONAL BIOASSAYS OF LAKE WYLIE, NORTH CAROLINA.
Nalco Environmental Sciences, Northbrook, Ill.
R. M. Gerhold.
In: 'Biostimulation and Nutrient Assessment,' (PRWG168-1), workshop proceedings September 10-12, 1975, Logan, Utah, Water Research Laboratory, Utah State Univ., Logan, November 1975, p. 175-220. 10 fig., 20 tab., 26 ref.

Descriptors: *Eutrophication, *Algae, *Bioassay, *Nutrients, North Carolina, Impoundments, Growth rates, Heated water, Phosphorus, Iron, On-site tests, Laboratory tests, Cyanophyta, Hydrogen ion concentration, Hydrologic aspects, Limiting factors, Chemical properties, Alkalinity, Nitrogen, Biomass.
Identifiers: *Algal growth potential, *Lake Wylie(N.C.), Microcystis aeruginosa, Oscillatoria curviceps, Anabaena flos-aquae.

Water samples from Lake Wylie were studied to understand nutrient relationships related to cultural eutrophication, seasonal changes in algal growth potential, limiting nutrients, biological availability of limiting nutrients, water quality characteristics important in controlling aquatic biota, and as a baseline for detecting significant changes. Samples were generally phosphorus-limited. Iron was occasionally critical. Doubling of the mean annual available phosphorus concentration would be necessary before another nutrient could become limiting. The Allen Steam Station did not affect the ability of Lake Wylie to support algal growth as a function of nutrient content. No urbanization effects were observed. Laboratory experiments and field observations supported the hypothesis that these waters were not conducive to excessive Microcystis aeruginosa growth and indicated that water with a low pH had a negative influence on algal growth. Oscillatoria curviceps was the dominant blue-green alga found. Blue-green algae were an insignificant portion of the total periphyton population at locations not under

e influence of the Allen Station hot water scharge. Seasonal influences were important in voring blue-green algae. Water quality factors H, nutrient loadings, organic matter, dissolved ygen, temperature) would have to change drastilly before Oscillatoria or Microcystis could pose threat to Lake Wylie. (See also W76-06696) uchanan-Davidson--Wisconsin).
76-06703

UTRIENT ASSESSMENTS AS A BASIS FOR AKE MANAGEMENT PRIORITIES,
isconsin Univ., Madison. Water Resources enter.
D. Uttormark, and J. P. Wall.
: 'Biostimulation and Nutrient Assessment,' RWG168-1), workshop proceedings September -12, 1975, Logan, Utah, Water Research aboratory, Utah State Univ., Logan, November 75, p. 221-240. 8 fig., 5 tab., 14 ref. R-801363.

escriptors: *Eutrophication, *Lakes, Management, *Trophic level, Wisconsin, Clasfication, Phosphorus, Runoff, Decision making, issolved oxygen, Fishkill, Water quality, rainage area, Turbidity.
entifiers: Phosphorus loading rate, Lake Condion Index.

method of assessing management choices based a lake classification index and phosphorusading estimates is presented. Assuming that a ophic condition is a continuous function of nosphorus-loading rates and restricting data to a all geographical area, a relationship between ading rate and lake condition can be demonrated. By combining this knowledge with lake mbers, sizes, and proximity to population cenrs, management priorities can be established. A ke condition index based on hypolimnetic disolved oxygen, transparency, fishkills, and use imairment was developed and aplied to Wisconsin kes. Indices were consistent with lake type and omparable to water quality characteristics, so can e used to quantify Wisconsin lake conditions. A lot of estimated phosphorus-loading versus lake ondition index for Wisconsin lakes was used to dicate management categories. The ratio of rainage basin area to lake area was plotted gainst the lake condition index. A plot of relative hosphorus-loading versus lake condition index ppeared to follow the expected trend. Although his approach indicated alternatives and priorities or lake water quality management, questions emain about whether it provides a perspective of ctual field conditions or whether the parameters eed refinement before results can be useful for anagement options. (See also W76-06696) Buchanan-Davidson--Wisconsin).
/76-06704

OMPARISON OF SEMI-CONTINUOUS AND ONTINUOUS FLOW BIOASSAYS,
Utah State Univ., Logan. Div. of Environmental ngineering.
H. Reynolds, E. J. Middlebrooks, D. B. orcella, and W. J. Grenney.
n: 'Biostimulation and Nutrient Assessment,' PRWG168-1), workshop proceedings September 0-12, 1975, Logan, Utah, Water Research aboratory, Utah State Univ., Logan, November 975, p. 241-265. 12 fig., 7 tab., 17 ref.

Descriptors: *Bioassay, *Laboratory tests, Cultures, Toxicity, Chlorophyta, Algae, Growth ates, Mathematical models, Temperature, henols, Competition, Inhibition.
Identifiers: *Selenastrum capricornutum.

n semi-continuous flow cultures the organism pecific growth rate, substrate concentration, and ell concentration vary, while in continuous flow ultures there is a steady state where organism pecific growth rate, substrate concentration, and ell concentration are theoretically constant. If the ithdrawal period in semi-continuous flow cultures is small enough, continuous flow cultures will be approximated. Actually continuous flow cultures may be considered as a special case of semi-continuous cultures where number of withdrawals per unit time in infinity. The critical factor is the time between withdrawal of culture content and addition of fresh substrate. An experiment was conducted to develop a mathematical model to predict temperature effects on phenol toxicity to Selenastrum capricornutum and to compare semi-continuous and continuous flow cultures. Both methods showed that phenol was more toxic at 24C than at 20C or 28C, but the level of toxicity indicated by continuous flow competitive inhibition constants was greater than that indicated by the semi-continuous flow constants. Continuous flow data showed that phenol was more toxic as the hydraulic residence time increased. These differences may be due to variation in the organism specific growth rate which is observed in semi-continuous cultures and may mask certain toxic effects. (See also W76-06696) (Buchanan-Davidson--Wisconsin).
W76-06705

THE EFFECTS OF MEDIA MODIFICATIONS UPON SELENASTRUM CAPRICORNUTUM IN BATCH CULTURES,
Utah Water Research Lab., Logan.
R. F. Malone, K. A. Voos, W. J. Grenney, and J. H. Reynolds.
In: 'Biostimulation and Nutrient Assessment,' (PRWG168-1), workshop proceedings September 10-12, 1975, Logan, Utah, Water Research Laboratory, Utah State Univ., Logan, November 1975, p. 267-292. 22 fig., 3 tab., 10 ref.

Descriptors: *Cultures, *Algae, *Growth rates, Chlorophyta, Mathematical models, Nitrogen, Laboratory test, Essential nutrients, Toxicity, Inhibition, Carbon, Bicarbonates, Phosphates, Hydrogen ion concentration.
Identifiers: *Culture media, *Algal groth potential, Selenastrum capricornutum, Algal Assay Procedure.

In order to develop a mathematical model which accurately predicts the growth of Selenastrum capricornutum under nitrogen limited conditions, an algal growth simulation program was developed permitting simulation of algal growth in batch, semi-continuous, and continuous cultures. When a 0.03 M sodium or potassium phosphate buffer system was used with modified PAAP or NAAM media, a significant reduction in algal growth occurred. This inhibition caused an essential nutrient to be removed, and there may also be a toxicity effect due to the high total dissolved solids level. Addition of 1.512 mg/l sodium bicarbonate to the modified PAAP medium was enough to fulfill the carbon supplementation needs of unaerated cultures, but higher levels of sodium bicarbonate caused minor to severe inhibition of growth. In unbuffered cultures utilizing sodium bicarbonate for carbon supplementation, growth seemed to be limited by pH; use of a buffer with this medium could increase growth. Nitrogen limitation was not significant until nitrogen levels in the modified PAAP medium were reduced to below 0.6 of the unmodified concentration. At 0.2 and 0.4 nitrogen levels, cultures were limited by some factor other than nitrogen until the algal density reached a high level. (See also W76-06696) (Buchanan-Davidson--Wisconsin)
W76-06706

SEDIMENT-WATER MICROCOSMS FOR ASSESSMENT OF NUTRIENT INTERACTIONS IN AQUATIC ECOSYSTEMS,
Utah Water Research Lab., Logan.
D. B. Porcella, V. D. Adams, and P. A. Cowan.
In: 'Biostimulation and Nutrient Assessment,' (PRWG168-1), workshop proceedings September 10-12, 1975, Logan, Utah, Water Research Laboratory, Utah State Univ., Logan, November 1975, p. 293-322. 7 fig., 7 tab., 38 ref. OWRT B-081-UTAH (3).

Descriptors: *Limnology, *Laboratory tests, *Design, *Ecosystems, Chemical reactions, Balance of nature, Nitrogen, Carbon dioxide, Oxygen, Methane, Hydrogen sulfide, Photosynthesis, Sediment-water interfaces, Anaerobic conditions, Analytical techniques, Gases, Nitrogen fixation, Nitrification, Denitrification, Hydrogen ion concentration, Dynamics, Iron, Phosphorus.

Microcosms designed to observe sediment-water interactions of chemical balances of important elements and to perform bioassays in microbially-dominated sediment-water systems are described. Nitrogen, carbon dioxide, oxygen, methane, ethylene, and hydrogen sulfide were detected. In the dark oxygen was used rapidly, thus oxygen was low in the water and atmosphere while the sediment was anaerobic. Atmospheric nitrogen dynamicc were not appreciably affected by nitrogen fixation. Oxygen dynamics were responsive to benthic oxygen demands in dark microcosms; in the light photosynthesis released oxygen into the atmosphere. Carbon dioxide dynamics caused a pH of 6.5-7.0 in the dark and 9.5-10.0 in the light. Methane was produced in all microcosm sediments after 40 days and ethylene after 120 days. Dissolved oxygen dynamics in lighted microcosms showed that almost all carbon dioxide was used. Sediment nitrogen output was small but input was appreciable, especially in upper layers. Nitrogen fixation only occurred in lighted microcosms indicating fixation by blue-green algae. In lighted microcosms nitrogen fixation was enough to fill nitrogen requirements but another nutrient was limiting growth. Denitrification occurred in the plus nitrogen dark microcosms; nitrification was not observed. Organic iron and iron-phosphorus interactions controlled iron and phosphorus availability; these elements were supplied by sediments in excess of photosynthetic needs. (See also W76-06696) (Buchanan-Davidson--Wisconsin)
W76-06707

EFFECTS OF WATER HARDNESS, PHOSPHORUS CONCENTRATION AND SAMPLE PRETREATMENT ON THE ALGAL ASSAY PROCEDURE--BOTTLE TEST,
FMC Corp., Princeton, N.J. Environmental Research Labs.
J. F. Jadlocki.
In: 'Biostimulation and Nutrient Assessment,' (PRWG168-1), workshop proceedings September 10-12, 1975, Logan, Utah, Water Research Laboratory, Utah State Univ., Logan, November 1975, p. 323-333. 7 tab., 4 ref.

Descriptors: *Bioassay, *Cultures, *Hardness(Water), *Phosphorus, Growth rates, Chlorophyta, New York, Indiana, Calcium carbonate, Sampling, Water treatment, Fluorescence, Chemical analysis, Standing crops, Precipitation(Chemical), Chlorophyll, Eutrophication.
Identifiers: *Algal assay procedure, *Selenastrum capricornutum.

To determine if different types of pretreatment affect the results of the algal assay procedure-bottle test, chemical and algal assays were made on samples from lakes in New York and Indiana. Algal assays using Selenastrum capricornutum were done on water samples before treatment or after pretreatment by autoclaving and/or filtration. The results indicated that pretreatment of the water samples may cause erroneous results in the algal assay procedure-bottle test. The controlling factors include water hardness, phosphorus concentration, and standing algal crops. Waters which are very hard (above 200 ppm as calcium carbonate) and have a high orthophosphate concentration (above 10 micrograms/l) may form a precipitate during autoclaving which effectively depletes the available phosphorus, especially if the precipitate is removed by filtration. A substantial growth of algae (over 200 fluorescence units from in vivo chlorophyll-a) in these waters would release enough dissolved phosphors during autoclaving to

cause a net increase in soluble phosphorus concentration. Much of the increased analyzable orthophosphate was apparently not available for Selenastrum growth, since the expected growth corresponding to the increased orthophosphate analyses was not observed. Filtration pretreatment may also remove large amounts of total phosphorus from eutrophic water samples. (See also W76-06696) (Buchanan-Davidson--Wisconsin)
W76-06708

A BIOASSAY DILUTION TECHNIQUE TO ASSESS THE SIGNIFICANCE OF DREDGED MATERIAL DISPOSAL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. H. Plumb.
In: 'Biostimulation and Nutrient Assessment,' (PRWG168-1), workshop proceedings September 10-12, 1975, Logan, Utah, Water Research Laboratory, Utah State Univ., Logan, November 1975, p. 335-346. 2 fig., 3 tab., 10 ref.

Descriptors: *Analytical techniques, *Bioassay, *Dredging, *Sediments, Nitrogen, Phosphorus, Algae, Growth rates, Nutrients, Cultures, Diffusion, Alabama.
Identifiers: *Algal growth potential, Dunaliella tertiolecta, Selenastrum capricornutum, Mobile Harbor(Ala), Algal assay procedure, Elutriate test.

A potential problem at open-water dredged material disposal sites is that nutrients (nitrogen and phosphorus) associated with dredged sediment and interstitial water may stimulate algal growth. Conventional bioassays are not applicable, since they only provide information on nutrient bioavailability in dredged material, not the significance of discharge, as conventional bioassays are run for long periods compared to the duration of dredged material perturbation. A bioassay is proposed, based on nonlinear diffusion data observed in the field, approximating changing concentration-time relationships at disposal sites. Elutriates were prepared by shaking sediment with site water, then allowing it to settle. After centrifugation and filtration, samples were inoculated with Dunaliella tertiolecta or Selenastrum capricornutum. At times selected by analysis of dye diffusion data, cultures were diluted to approximate what may happen at the disposal sites. Results with Dunaliella suggested that open-water disposal of Mobile Harbor (Alabama) sediments would have no significant effect on algal population; concentrated elutriates were toxic to Dunaliella. It is concluded that inhibitory and stimulatory additions would not significantly affect algae when dilution rates at open-water sites are considered. The method could provide information to help determine the appropriate method of dredged material disposal. (See also W76-06696) (Buchanan-Davidson--Wisconsin)
W76-06709

APPLICATIONS OF AEROSPACE TECHNOLOGY IN THE PUBLIC INTEREST: POLLUTION MEASUREMENT,
Denver Research Inst., Colo.
C. F. Heins, and F. D. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161, as N74-19234, $4.50 in paper copy, $2.25 in microfiche. Report February 1974. 64 p. 7 fig., 4 tab., 34 ref. NASW-2362.

Descriptors: *Research and development, *Technology, *Remote sensing, Measurement, Pollution abatement, Monitoring, Water pollution, Weather forecasting, Equipment, Satellites(Artificial), Instrumentation, Data collections.
Identifiers: *National Aeronautics and Space Admin.

The contributions of the National Aeronautics and Space Administration to the techniques of pollution analysis and measurement are detailed. Three examples of air pollution monitors include the spectroscopic Dual Isotope Fluorescence Carbon Monoxide Monitor, the Dispersive Infrared Vehicle Exhaust Analyzer, and the Microwave Formaldehyde Analyzer. NASA's satellite sensing program utilizes the Vertical Temperature Profile Radiometer which can obtain temperature data under partly cloudy conditions, ERTS-1 monitors pollutants in coastal waters and lakes, and air pollutants by interferometry. It is conducting research aimed at achieving pollutant measurement, on a global basis, of long-lived gases, such as carbon monoxide, and their sources and sinks. Their satellite Nimbus G (Nibus 6) will have the primary objective of detecting, identifying, mapping, and measuring air and ocean pollution to establish baseline levels. NASA-generated technology transfers for pollution measurement and control include methods to estimate carbon monoxide exposure, a correlation spectrometer for air pollution remote sensing, heat pipe applications for heat transfer, analytic techniques for organic water pollutants; telemetry systems for remote monitoring; environmental models and analysis, weather satellite data for air pollution control, computer programs to analyze combustion, a fuel vaporization model, a coal desulfurization process, and has increased the quality of antipollution equipment in offshore petroleum operations. (Auen-Wisconsin)
W76-06710

DIFFERENCES IN CHEMICAL COMPOSITION BETWEEN TWO SPECIES OF DAPHNIA AND SOME FRESHWATER ALGAE CULTURED IN THE LABORATORY,
Pittsburgh Univ., Pa. Dept. of Biology.
U. M. Cowgill, and C. W. Burns.
Limnology and Oceanography, Vol. 20, No. 6, p. 1005-1011, 1975. 3 fig., 3 tab., 10 ref.

Descriptors: *Absorption, *Chemicals, *Plankton, Daphnia, Algae, Chemical analysis, Heavy metals, Connecticut.
Identifiers: Daphnia pulex, Daphnia magna, Euglena gracilis, New Haven(Conn.).

Water from West Spring in New Haven, Connecticut, containing 53 elements, was used to culture Daphnia magna and D. pulex and algae. Fifty-four elements were detected in the plankton. The Daphnia were fed with a monoculture of Euglena gracilis supplemented occasionally with mixed cultures containing E. gracilis and varying proportions of Chlorophyceae. A comparison of the mean concentration (dry weight basis) of the Daphnia species and the two algal cultures showed the Daphnia concentration factor of 17.5 for chlorine, 6.9 for calcium, and 4.5 for sodium over that of the algae which it consumed. Concentration factors of the order of two were shown by Daphnia for scandium, neodymium, lanthanum, zirconium, bromine, and nickel over those of the algae. The algae accumulated greater concentrations of molybdenum, iron, magnesium, tin, silver, titanium, beryllium, copper, zinc, iodine, manganese, phosphorus, aluminum, arsenic, cobalt, potassium, lead, mercury, and silica, and contained about the same concentrations of cadmium as Daphnia. The chlorine concentration in the algae was quite small, suggesting that they exclude it from their cells. The algae concentrated the elements in the order of thousands, and in some cases greater. The mercury concentration in the plankton was unexpectedly high but the source of the mercury was undetermined. (Auen-Wisconsin).
W76-06713

ACCUMULATION RATE AND TURNOVER TIME OF ORGANIC CARBON IN A SALT MARSH SEDIMENT,
North Carolina State Univ., Raleigh. Dept. of Zoology.
L. M. Cammen.
Limnology and Oceanography, Vol. 20, No. 6, p. 1012-1015, 1975. 2 fig., 2 tab., 7 ref. DACW-72-73-C-0025, NOAA 04-3-158-40.

Descriptors: *Cycling nutrients, *Carbon, *Sediments, *Tidal marshes, North Carolina.
Identifiers: *Carbon accumulation, Core Banks(N.C.), Drum Inlet(N.C.), Nutrient sources.

The rate of organic carbon production and the turnover time in Core Banks, a tidal salt marsh near Drum Inlet, North Carolina, were measureed in natural sediments, bare spoil, spoil planted with Spartina alterniflora, and planted spoil fertilized with N and P. The concentration of organic carbon from low intertidal areas showed a logarithmic decrease with depth. Organic carbon (g sp m) incorporated in the top 13 cm of the low intertidal bare spoil was 107.0, 116.0 for planted spoil, and 129.1 for fertilized spoil. The net rate of accumulation of organic carbon (g sq m/yr) was 80.3 in the bare spoil, 87.0 in the planted spoil, and 96.8 in the fertilized spoil. The turnover time was estimated to be 3.7 to 4.5 years. It appeared that the main source of organic carbon was not growth and decomposition of Spartina but more likely a combination of detrital matter carried in by tidal action and benthic algae. The unvegetated plot had accumulated almost as much carbon as the plots with abundant Spartina. Inasmuch as benthic algal production in North Carolina probably is between 79 to 99 g C sq m/yr, the benthic algae alone could have accounted for virtually all of the accumulated carbon. (Auen-Wisconsin).
W76-06714

DEVELOPMENT OF OXYGEN DEFICITS IN 14 SOUTHERN ONTARIO LAKES,
Trent Univ., Peterborough(Ontario). Dept. of Biology.
D. C. Lasenby.
Limnology and Oceanography, Vol. 20, No. 6, p. 993-999, 1975. 1 fig., 3 tab., 24 ref.

Descriptors: *Oxygen sag, *Hypolimnion, *Measurement, *Trophic level, Canada, Standing crop, Seston, Opacity, Lake sediments.
Identifiers: Ontario.

The usefulness of the hypolimnetic oxygen deficit as an indirect measure of standing crop was investigated in 14 southern Ontario lakes by comparing the deficit with a summer average for dry weight of seston and with Secchi depth in order to determine the importance of the choice of the upper limit of the hypolimnion in calculating the oxygen deficit and to test the linearity of its development. In 13 of the 14 lakes, the hypolimnetic areal oxygen deficit increased as the upper limit of the hypolimnion of theat lake was chosen at successively deeper levels. With the exception of one lake, the decrease was linear. Areal hypolimnetic oxygen deficits ranged from 0.006 to 0.41 mg sq cm/day and did not correlate with average dry weights of seston (an indication that they may not be related), but were negatively correlated with Secchi depth; the effect of this decrease on the calculated deficit suggest that real and possible causative relationships exist between the transparency of the water in the epilimnion and rates of oxygen depletion in the hypolimnion. (Auen-Wisconsin).
W76-06715

THE ACID-BUBBLING METHOD FOR PRIMARY PRODUCTIVITY MEASUREMENTS MODIFIED AND TESTED,
Iceland Univ., Reykjavik. Science Inst.
For primary bibliographic entry see Field 5A.
W76-06716

PHOSPHORUS SOURCES FOR THE LOWER MADISON LAKES,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5B.
W76-06718

HE EFFECTS OF A BENTHIC GRAZER ON HE PRIMARY PRODUCTIVITY OF THE LIT-ORAL ZONE OF LAKE TAHOE,
alifornia Univ., Davis. Div. of Environmental tudies.
. W. Flint, and C. R. Goldman.
imnology and Oceanography, Vol. 20, No. 6, p. 35-944, 1975. 7 fig., 2 tab., 21 ref. NSF RANN GI-2.

escriptors: *Primary productivity, *Crayfish, Grazing, *Littoral, Aquatic plants, Periphyton, ypolimnion, Invertebrates, California, Nevada, ycling nutrients, Oligotrophy, California.
lentifiers: *Lake Tahoe(Calif), Pacifastacus niusculus.

he crayfish, Pacifastacus leniusculus, because of s dominant biomass in the littoral zone occupies a nique trophic position in Lake Tahoe. Submerged acrophytes above 50 m are scarce as are animal ood materials during much of the year, thus the rayfish population relies substantially on the lit-oral benthic periphyton for its food. This in-estigation was designed to establish what effect ie crayfish has on the littoral zone periphyton roduction and to assess the effects of its grazing n aquatic macrophytes and its role in the cycling of nutrients. The nutrient contribution y crayfish excretion serves as an important ource of ammonia which is converted to nitrate y heterotrophic activity and becomes directly vailable to periphyton. The importance of these utrients to the benthic community was shown by ie absence of any abnormal increase in nutrient vels in the water column and the lack of any verall increase in nitrogen in the lake indicated pid recycling of this nutrient. The relationship etween the crayfish and the benthic flora por-ays a dynamic balance between primary and econdary production in this extremely ligotrophic environment. The crayfish represents n effective 'cleanser' of the littoral area and pro-ides a stable food source for the lake trout. Auen-Wisconsin)
776-06719

CTIVITY COEFFICIENTS OF BICAR-ONATES AND CARBONATES IN SEAWATER,
regon State Univ., Corvallis. School of Oceanog-phy.
. M. Pytkowicz.
imnology and Oceanography, Vol. 20, No. 6, p. 71-975, 1975. 5 tab., 21 ref. NR083-102, NSF ES-7201631, ONR N00014-67-A-0369-0007.

escriptors: *Analytical techniques, *Carbonates, Bicarbonates, *Sea water, Measurement, Esti-ating equations.
lentifiers: Activity coefficients.

ata on single ion and mean activity coefficients re of use in physicochemical studies such as the terpretation of the solubility behavior of inerals in seawater. Mathematical equations are esigned which allow the determination of the otal (stoichiometric) activity coefficients of bicar-onate and carbonate ions in seawater as a func-on of the salinity from ratios of the ther-odynamic and apparent dissociation constants of rbonic acid. This method makes it unnecessary resort to ion-pairing models and thus avoids any assumptions. The first comprehensive mean ctivity coefficients of bicarbonate and carbonate alts taken from various sources are compiled; owever their accuracy is unknown because of the ean-salt method assumptions and because the ccuracies of the various components used in etermination of the single-ion activity coeffi-ents of bicarbonate and carbonate have not been tablished. They should, therefore, be compared values obtained by independent means for carbonates as shown in the text. The single-ion ctivity coefficients of bicarbonate and carbonate resented as a function of salinity should be of use geochemists who seek fast calculations of the stribution of carbon dioxide species in sedi-ments. However, the values are only valid for pore waters with roughly the same relative composition as seawater. (Auen-Wisconsin)
W76-06720

APPARATUS FOR THE IN SITU CONCENTRATION OF TRACE METALS FROM SEAWATER,
Environmental Research Lab., Narragansett, R.I.
For primary bibliographic entry see Field 5A.
W76-06721

SIMILARITIES BETWEEN THE UPTAKE OF NUTRIENTS AND INGESTION OF PREY,
M. Parker.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 56-59, 1975. 6 ref.

Descriptors: *Productivity, *Digestion, *Absorption, *Predation, Mathematical models, Feeding rates, Equations.

The theorem is advanced that there may be a widespread unity in the process by which all organisms ingest food supported by the views that (1) both mouths and uptake sites are recycling entities performing similar functions; (2) that the Michaelis-Menton equation and Holling's (1965, 1966) equation, respectively, describe nutrient uptake by algae, etc., and ingestion by animals; (3) derive the Michaelis-Menton equation for animals possessing mouths; and (4) that the derived equation is similar to that of Holling. An equation depicts the ingestion process in a manner similar to an enzymatically catalized reaction, identifying the respective rate constants for obtaining, rejecting, and swallowing food, which generates equations expressing the rate of change in ingested food, food being processed, and food in the environment. If a steady state for mouths processing food is reached on a time scale short relative to changes in available and ingested food, and if mouths and food move randomly through the environment, and equation can be derived for the ingestion rate of one type of food. The generalizations are that: there are upper limits imposed on ingestion rates by the constraints of time, the law of nonsuperposition, and the fact that organisms and stomachs are finite in size; and that all ingestion is similar because of the recycling nature of both mouths and uptake sites. (Auen-Wisconsin)
W76-06723

A PISTON CORER FOR PEAT,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-06724

IDENTIFICATION AND MANAGEMENT OF EURASIAN WATER MILFOIL IN WISCONSIN,
Wisconsin Univ. Extension, Madison. Environmental Resources Unit.
S. A. Nichols.
Wisconsin Academy of Sciences, Arts and Letters, Vol. 63, p. 116-128, 1975. 4 fig., 1 tab., 25 ref.

Descriptors: *Aquatic weed control, *Plant morphology, Life cycles, Habitats, Reproduction, Harvesting, Wisconsin, Drawdown, Dredging, Light penetration, Mechanical control, Manual control.
Identifiers: *Eurasian milfoil, *Myriophyllum spicatum L., *Identification, Shading.

The identification of Eurasian milfoil (Myriophyllum spictaum L.) to differentiate it from the native Wisconsin variety (M. spictum var. exalbescens (Fernald) Jepson) is a prerequisite in a weed eradication program as only the invading specie restricts usage of lakes. A review of the morphological differences between the two types indicates that the Eurasian variety characteristically has 14 or more pairs of leaflets per leaf while the native variety ordinarily has less that 14 pairs of leaflets. The Eurasian variety has a wide ecological amplitude and its distribution is primarily governed by subtratum particle size, water depth, and water temperature. It has an affinity for alkaline waters and can utilize bicarbonate for photosynthesis. Its growth and reproduction is described. Repeated mechanical harvesting is effective in controlling milfoil; cleaning small problem areas with a rake is also beneficial. Habitat manipulation such as drawdown, dredging, and sand blanketing are also effective. Spot control of native milfoil was achieved by shading the surface of a farm pond with plastic sheeting. Recent research has indicated that milfoil has about the same protein content as alfalfa hay; also it has a high xanthophyll content, which may eventually make the species commercially valuable. (Auen-Wisconsin)
W76-06725

INFLUENCE OF WATERLOGGING ON MICROBIAL MINERAL WEATHERING, (IN FRENCH),
Centre National de la Recherche Scientifique, Vandoeuvre-les-Nancy (France). Centre de Pedologie Biologique.
J. Berthelin, and A. Kogblevi.
Rev Ecol Biol Sol 11(4); p 499-510, 1974.

Descriptors: *Microbiology, *Weathering, *Soils, Anaerobic conditions, Bacteria, Iron, Calcium, Magnesim, Manganese, Solubility, *Saturated soils.

A semi-continuous flow method was used for studying the influence of waterlogging on the microbial weathering of soil columns. One set of soil columns was waterlogged, the other normally drained. Sterile controls for both sets were made by addition of sodium merthiolate to the nutrient solution. The influence of waterlogging on net microbial solubilization process was depended on the chemical nature of the elements involved. It actively promoted the net microbial solubilization of Fe, Mn, and Ca at the beginning of the experiment. Net microbial solubilization of Si and Al decreased. Perfusion of 45 days resulted in leaching 129.5 mg of Fe2O3 from waterlogged nonsterile, 19.9 mg from normally drained, non sterile, 0.3 mg from waterlogged sterile, and 0.5 mg from normally drained sterile, columns. Corresponding weathering indices of Fe in waterlogged conditions was predominantly reductive process, since solubilized Fe was mostly ionic Fe and its production was correlated with very low Eh's (redox potentials) (-200 to -400mV). Waterlogging conditions decreased the aerobic microbial population, but it favored anaerobic bacteria and promoted the formation of organic volatile acids.--Copyright 1975, Biological Abstracts, Inc.
W76-06730

STUDY OF THE GENUS VIBRIO IN DRINKING WATER, (IN SPANISH),
Instituto Bacteriologico de Chile, Santiago.
J. H. Lobos, R. Greive, M. L. Quijada, and H. Brandt.
Bol Inst Bacteriol Chile 16(1/2), p 40-42, 1974.

Descriptors: Potable water, Epidemiology, Human diseases, Cultures, Salmonella, Pathogenic bacteria, Public health, Water pollution effects.
Identifiers: Cholera, *Vibrio.

Periodic study of the Vibrio genus for the diagnosis of cholera in the countries where it does not now exist is advisable. Recent epidemiological conditions have caused areas that are usually free from this disease to become infected. The prevalence of some species of Salmonella or other predominant enteropathogenic species can be investigated at the same time. This simple study can be done even with some culture media prepared in the laboratory.--Copyright 1975, Biological Abstracts, Inc.
W76-06731

STUDY OF THE STRONTIUM 90/STRONTIUM ISOTOPE BALANCE IN A LATVIAN LAKE, (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5A.
W76-06733

ON THE UNIVERSALITY OF THE POOLE AND ATKINS SECCHI DISK-LIGHT EXTINCTION EQUATION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5A.
W76-06737

PHOTOSYNTHETIC RATES OF PHYTOPLANKTON IN EAST AFRICAN ALKALINE, SALINE LAKES,
Duke Univ., Durham, N. C. Dept. of Zoology.
J. M. Melack, and P. Kilham.
Limnol Oceanogr. 19(5), p. 743-765, 1974.

Descriptors: *Photosynthesis, *Phytoplankton, Lakes, *Saline lakes, *Africa, Alkalinity, *Dissolved oxygen, Cyanphyta, Polarographic analysis.
Identifiers: Kenya, Tanzania.

Photosynthetic rates were calculated in 6 myxophycean-dominated alkaline, saline lakes in Kenya and Tanzania from changes in dissolved O2 in light and dark bottles and from diurnal variations in dissolved O2. Rates of gross photosynthesis are exceptionally high for Lake Nakuru, Kenya, by the diurnal free-water technique (e.g., 36 g O2 m-2 day-1). Gross photosynthesis in Lake Nakuru was compared for 2 consecutive days: on the 1st day pronounced thermal stratification developed and the dissolved O2 reached 340% saturation in the upper half meter; on the 2nd day wind-driven turbulence circulated the algae to depths often greater than 2 m in water with Secchi disk visibility of only 15 cm. Because of analytical difficulties in measuring dissolved O2 in soda lakes, laboratory experiments were conducted to determine the reliability of the titrimetric (Winkler, Miller), gasometric (Scholander) and polarographic (oxygen probe) methods. The polarographic technique was the most suitable for determinations of dissolved O2 in the field. --Copyright 1975, Biological Abstracts, Inc.
W76-06742

A TEMPERATURE-STRESSED STREAM ECOSYSTEM BELOW A HYPOLIMNIAL RELEASE MOUNTAIN RESERVOIR,
Colorado State Univ., Fort Collins. Dept. of Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
J. V. Ward.
Arch Hydrobiol. 74(2), p 247-275, 1974.

Descriptors: *Hyplimnion, *Colorado, *Ecosystems, Invertebrates, Reservoirs, Seasonal, Streams, *Water temperature, *Standing crops.

Biological, chemical and physical parameters were measured over a 12-mo. period at 4 sampling sites on the South Platte River below a Colorado mountain reservoir. Owing to the hypolimnial source, the stream temperature was higher than normal in winter, lower in summer, fluctuated less diurnally and seasonally and exhibited a seasonally displaced maximum. These effects decreased downstream, but still altered the temperature pattern 8.5 km below the dam. The number of species of macroinvertebrates progressively increased downstream, the temperature regime is probably responsible for the low diversity by failing to stimulate various developmental stages of the life cycle or by seasonally altering developmental patterns. The river below the dam is a temperature-stressed ecosystem, this is the major reason for the low diversity and large standing crop of macroinvertebrates. --Copyright 1975, Bilogical Abstracts, Inc.
W76-06743

A STUDY OF THE BENTHIC MACRO-INVERTEBRATES OF A SHALLOW EUTROPHIC RESERVOIR IN SOUTH WALES WITH EMPHASIS ON THE CHIRONOMIDAE (DIPTERA); THEIR LIFE HISTORIES AND PRODUCTION,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
D. W. B. Potter, and M. A. Learner.
Arch Hydrobiol. 74(2), p 186-226, 1974.

Descriptors: Reservoirs, Lakes, *Eutrophication, *Invertebrates, *Diptera, Benthic fauna, *Life cycles, *Production, Water pollution effects.
Identifiers: Hirudinea, Isopoda, South Wales, Shallow reservoirs.

Production and life-history studies were carried out in 1970 and 1971 on the principal macro-invertebrate species and groups inhabiting the benthic deposits of a shallow eutrophic reservoir in South Wales (United Kingdom). The species studied belonged to the Chrionomidae (11 spp.), Tubificidae (2 species-groups), Hirudinea (1 sp.), Isopoda (1 sp.). Total production was about 37 g dry weight/m2/yr, 43% of which was chironomid production. Comparison is made with production estimates obtained for other lakes in Europe.--Copyright 1975, Biological Abstracts, Inc.
W76-06747

FLOODING AS THE RESULT OF HURRICANE AGNES, AND ITS EFFECT ON A MACROBENTHIC COMMUNITY IN AN INFERTILE HEADWATER STREAM IN CENTRAL PENNSYLVANIA,
Pennsylvania Fish Commission, Bellefonte. Benner Spring Fisheries Research Station.
L. Hoopes.
Limnol Oceanogr. 19(5), p 853-857, 1974.

Descriptors: *Pennsylvania, *Benthos, Discharge(Water), *Peak discharge, *Floods, Streamflow.
Identifiers: *Hurricane Agnes(1972), Burns Run(Penn).

Hurricane Agnes in June 1972 resulted in a 150-fold increase in the discharge of Burns Run, Pennsylvania (USA). A 22.7 m3 sec-1 peak discharge severely depressed the benthic community which, however, recovered by Oct. 1972.--Copyright 1975, Biological Abstracts, Inc.
W76-06748

THE BACTERIAL COMPOSITION, AND THE METABOLIC ACTIVITY OF SOME PHYSIOLOGICAL GROUPS OF BACTERIA IN TWO GRAVEL PIT LAKES,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Limnologisches Institut.
I. Daubner, and R. Ritter.
Arch Hydrobiol. 72(4), p 440-459, 1873.

Descriptors: Lakes, Gravels, *Denitrification, *Metabolism, *Bacteria, Microbiology, *Nitrification, Water pollution effects.
Identifiers: *Ammonification, *Gravel pit lakes.

Complex microbiological analysis of the water in 2 gravel pits were conducted in parallel with laboratory experiments during the course of a yr. A correlation was noted between the numbers of physiological bacteria groups and their metabolic activity. Ammonification, nitrification and denitrification were investigated.--Copyright 1975, Biological Abstracts, Inc.
W76-06749

OWASCO LAKE AND ITS WATERSHED, A SUMMARY REPORT WITH TWO APPENDICES AND MAPS,
Cornell University, Ithaca, N. Y. Dept. of Natural Resources.
R. T. Oglesby, L. S. Hamilton, E. Mills, and P. Willing.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 939, $7.75 in paper copy, $2.25 in microfiche. Cornell University Water Resources and Marine Sciences Center, Technical Report No. 70, June 1973. 199 p, 2 append. OWRT B-030-NY(1), 14-01-0001-3832.

Descriptors: Water quality, *New York, Lakes, Watersheds(Basins), *Baseline studies, *Eutrophication, Water quality standards, Fish population, *Land use, Environmental effects, *Land development, Aesthetics, Mapping, Geomorphology, Slopes, Soils, Groundwater, Water pollution effects, Attitudes, Social values, Social change.
Identifiers: *Owasco Lake(NY), Environmental quality, Soil depth.

The following topics concerned directly with Owasco Lake and its tributaries, are considered: Establishment of a baseline description of water quality for comparison against any future changes that occur. Comparison of all water quality data collected since 1910 and that from the present study to see if any historical trends (particularly those that might indicate accelerated eutrophication of the lake) could be detected. A determination of the principal factors affecting water quality, with the exception of public health related parameters, for which County and State health authorities have clearly stated responsibilities. Some interactions between the Owasco Lake environment and the fish populations of the lake are described. The concept of limitations to land uses is presented as a means of maintaining environmental quality. Specific physiographic limiting factors such as slope, soil depth, flood susceptibility, and groundwater supplies are discussed and mapped on overlays. The constraints they offer to development are set forth. Aesthetic and cultured features which should not be damaged by incompatible development are identified and mapped on an overlay. A final composite of limiting features is presented as a planning guide to identify where on-site investigations may be needed to prevent loss of environmental quality when a change in land use is proposed. Management alternatives relating to land use in the Owasco basin are presented and discussed.
W76-06751

HYDROGRAPHICAL FEATURES OF NORDBYTJERNET, A MANGANESE-RICH MEROMICTIC LAKE IN SE NORWAY,
Oslo Univ. (Norway). Dept. of Limnology.
D. Hongve.
Arch Hydrobiol. 72(4), p 227-246, 1974.

Descriptors: Lakes, Europe, *Manganese, Hydrography, *Iron, Organic matter, Oxygen, Lake sediments, Water pollution effects.
Identifiers: Macrophytes, *Meromictic lakes, *Norway(Nordbytjernet), *Oxygen depletion.

Nordbytjernet is a meromictic lake where large concentratins of Fe and Mn have been found in the monimolimnion. The concentration of Mn is of an order of magnitude which is very remarkable in natural surface water. The special conditions depend upon large supplies of Fe and Mn which are continuously delivered by inflowing ground water. Large amounts of organic matter, mainly produced as macrophytes in the littoral, cause lack of O2 and reduction of Fe and Mn in the hypolimnion. The sediments also possess abnormal contents of Fe and Mn, which, according to the solubility products, must be precipitated as FeCO3 and MnCO3. --Copyright 1975, Biological Abstracts, Inc.
W76-06752

EMPIRICAL FUNCTIONS RELATING METABOLIC PROCESSES IN AQUATIC SYSTEMS TO ENVIRONMENTAL VARIABLES,
Washington State Univ., Pullman. Dept. of Zoology.
R. A. Parker.
J Fish Res Board Can. 31(9), p 1550-1552, 1974.

Descriptors: *Metabolism, *Light intensity, Temperature, *Nutrients, Aquatic environment.

Two empirical relationships were proposed to describe the metabolic consequences of high and low levels of light intensity, temperature and nutrients in aquatic systems. Their performance was evaluated for 3 sets of data taken from the literature.--Copyright 1975, Biological Abstracts, Inc.
W76-06755

CONTROL OF SPECIES COMPOSITION IN ENRICHED MASS CULTURES OF NATURAL PHYTOPLANKTON POPULATIONS,
Skidaway Inst. of Oceanography, Savannah, Ga.
W. M. Dunstan, and K. R. Tenore.
Appl Ecol. 11(2), p529-536, 1974.

Descriptors: *Phytoplankton, *Algae, Aquaculture, Cultures, Nutrients, Eutrophication, Nitrogen, Phosphorus, Seasonal, Sewage effluents, Diatoms, Chlorophyta.
Identifiers: Cylindrotheca-Closterium, Silicon, Skeletonema-Costatum, Stephanopyxis-Costata.

The changes in species composition of intensively harvested outdoor cultures of enriched natural populations of micro-algae were studied using a variety of nutrient additions and dilution rates. The control of species in such semi-continuous outdoor cultures is not only important for aquaculture systems but is also helpful in identifying the effects of eutrophication on coastal phytoplankton populations. In a series of 3 experiments in which cells were counted and identified during the 6th-10th day of the daily 50% harvest, N, P and Si definitely favored the growth of diatoms. The addition of just N and P or N, P and trace metals stimulated a green microalgae population. Addition of treated sewage effluent resulted in a 70-80% diatom culture. In another series of experiments the rate of daily dilution was varied and in 2 experiments in June a clear control of species composition resulted. In 10% daily dilution green micro-algae dominated while at 75% dilution diatoms dominated particularly Skeletonema costatum (now Stephanopyxis costata). The results from experiments in July and Aug. were not as definitive as those in June and the ubiquitous diatom Cylindrotheca closterium prevailed at all dilution rates. --Copyright 1975, Biological Abstracts, Inc.
W76-06757

OBSERVATIONS AND EXPERIMENTS ON THE PHYTOPLANKTON OF BLELHAM TARN, ENGLISH LAKE DISTRICT I. THE EXPERIMENTAL TUBES,
T. J. Lack, and J. W. G. Lund.
Freshwater Biol. 4(4), p399-415, 1974.

Descriptors: *Phytoplankton, Limnology, Lakes, Seasonal, Tubes, Sampling, Algae, Europe.
Identifiers: Melosira-Italica-SSP-Subarctica.

Tubes composed on butyl rubber were placed in a small English lake in an area where the water is 11-12 m deep. Each tube, when fully distended, contained over 18,000 m3 of water. The tubes were anchored to the shore and lake bottom. A boat was rowed into them over a specially strengthened portion of the margin. The 1st was installed and its water isolated from that in the lake by the end of July 1970 and the 2nd tube at the beginning of Oct. 1970. The installation, maintenance and performance of the tubes are described; as are suggested improvements. The temperature regime in the tubes closely follows that in the lake. If the chemical conditions are favorable, the seasonal cycle of Melosira (italica ssp. subarctica) in a tube is similar to that in the lake. Contamination of the water in the tubes by that in the lake is slight and has a negligible effect on chemical conditions within them. Water can be lost from the tubes under certain conditions. The reverse does not happen. The phytoplankton communities in the tubes are similar in quality to those of the lake, even after 2.5 yr of separation. The tubes are apparently suitable for investigations on certain factors determining the abundance and seasonal cycles of algae in lakes and for other limnological studies. --Copyright 1975, Biological Abstracts, Inc.
W76-06758

POLYSPECIES AQUACULTURE SYSTEMS: THE DETRITAL TROPHIC LEVEL,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
K. R. Tenore, M. G. Browne, and E. J. Chesney, Jr.
J Mar Res. 32(3), p425-432, 1974.

Descriptors: *Aquaculture, *Oysters, *Trophic level, Detritus, Phytoplankton, Amphipoda, Cultures.
Identifiers: Capitella-Capitata, Corophium-Sp, Nereis-Virens, *Polychaetes.

The production of species belonging to the detrital trophic level was investigated in model-sized aquaculture system, with flowing, filtered seawater and controlled phytoplankton addition to experimental tanks containing the oyster, Crassostrea virginica. The biodeposits of feces and pseudofeces of the oysters supported on the bottom of 1 tank a population of the nereid polychaete, Nereis virens and in the other tank a mixed community of the capitellid polychaete, Capitela capitata and the amphipod, Corophium sp. The nereids showed a 2.8 fold increase in average weight of worm in 100 days and the Capitella-Corophium community reached a standing biomass of 24.4 grams carbon/m2. The feasibility of successful culture of such species in polyculture systems is suggested. Polyculture both increases and diversifies the crop production and eliminates the build-up of detrital wastes characteristic of simple food chains in aquaculture. --Copyright 1975, Biological Abstracts, Inc.
W76-06759

LAKE ELLESMERE, CANTERBURY, NEW ZEALAND: A REVIEW OF THE LAKE AND ITS CATCHMENT,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Ecology Div.
H. R. Hughes, R. H. S. McColl, and D. J. Rawlence.
N Z Dep Sci Ind Res Inf Ser. 99, p 1-27. 1974.

Descriptors: *Lakes, Eutrophication, Algae, Blue-Green algae, Canada goose, Fish, Swams, Trout, Weeds, Water pollution effects.
Identifiers: Lake Ellesmere(New Zealand).

Lake Ellesmere, New Zealand, and its agricultural catchment are described with special reference to the lake's biology and chemistry, and the interests of the management authority-the North Canterbury Catchment Board, farmers, commercial fishermen, sportsmen, and the general public. The lake, which is shallow and nutrient-rich, is periodically opened to the sea, allowing drainage and influx of sea water. Problems giving concern are eutrophication of the lake, the appearance of bluegreen algal blooms, the disappearance of aquatic weed beds supporting some of the water fowl, particularly black swan, the depredation of farmland by black swan and Canada geese (apparently as a result of reduced food supplies in the lake), the failure of the black swan to breed, deaths of commercial fish and difficulties in controlling lake level. Problems in contributing drains and waterways are the control of water flow and quality, excessive aquatic weed growth and the provision of sufficient water for irrigation while maintaining the trout fishery. Recommendations are made of practical methods for minimizing the deterioration of Lake Ellesmere and for further research to facilitate improved management.--Copyright 1975, Biological Abstracts, Inc.
W76-06762

THE IMPORTANCE OF THE EFFECT OF THE CHEMICAL COMPOSITION OF WATER ON THE POPULATION OF SNAILS: INTERMEDIATE HOSTS OF SCHISTOSOMES IN EGYPT,
Bilharziasis Research Inst., Cairo (Egypt).
A. A. El-Hassan.
Folia Parasitol (Prague). 21(2), p 169-179. 1974.

Descriptors: *Snails, Gastvopods, *Ions, Chemical properties, Population, Toxicity, Habitats, Distribution.
Identifiers: Biomphalaria-Alexandrina, Bulinus-Truncatus, Egypt, Schistosomes.

The effect of the chemical composition of water on the distribution of Bulinus truncatus truncatus and Biomphalaria alexandrina alexandrina, the 2 snail intermediate hosts of schistosomes, was studied. The lethal concentration of common ions present in fresh water for different stages of the snails was obtained. The least tolerant stages are newly hatched snails of both species. Biomphalaria snails are more tolerant than Bulinus snails to the examined ions. In the field, the concentration of various ions in water-bodies seldom reaches these lethal extremes. Some variations in the chemical composition of water were observed in habitats harboring each species. The restricted distribution of Biomphalaria snails in the Delta and its absence from Upper Egypt cannot be attributed to variations in the chemical constituents of water. Both the Delta and Upper Egypt contain water-bodies with microhabitats suitable for the establishment of both snail species. The chemical composition of water may indirectly influence the distribution of snail intermediate hosts by influencing the types and growth of microflora which is essential as food for the snails.--Copyright 1975, Biological Abstracts, Inc.
W76-06763

GENETIC DIFFERENCES IN SUSCEPTIBILITY TO TWO DISEASES AMONG STRAINS OF THE COMMON CARP,
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station.
R. S. Hines, G. W. Wohlfarth, R. Moav, and G. Hulata.
Aquaculture. 3(2), p 187-197, 1974.

Descriptors: *Carp, *Fish diseases, Ponds, Fisheries, Fish management, Fish stocking.
Identifiers: Aeromonas-Liquefaciens, Israel, *Epidemal epithelioma.

In a test involving 5 inbred strains, and 9 strain crossbreds of the common carp, 1 inbred strain was infected by Epidermal epithelioma disease and a 2nd inbred strain was infected by a swim bladder inflammation. Crossbreds between these 2 strains, as well as between them and other strains did not show a single fish infected by either disease. Susceptibility to both of these diseases is probably controlled by recessive genetic factors. It appears that the decreased incidence of Epidermal epithelioma in Israeli fish ponds in recent years has been due to the increased use of selected crossbred carp fry. The incidence of Epidermal epithelioma was twice as high in experimental ponds with a high stocking rate than in those with a lower stocking rate. The swim bladder inflammation was apparently due to a blockage of the pneumatic duct, with secondary infection by Aeromonas liquefaciens.--Copyright 1975, Biological Abstracts, Inc.

W76-06764

ASSOCIATIONS OF BLUE-GREEN ALGAE OF THERMAL SPRINGS OF STRAVROPOL AND KRASNODAR KRAIS AND GEORGIAN SSR, (IN RUSSIAN),
Leningrad State Univ. (USSR).
V. N. Nikitina.
Vestn Leningr Univ Biol 1, p 54-59. 1975.

Descriptors: Algae, *Cyanophyta, *Thermal springs, Reservoirs, Plankton, Aquatic algae.
Identifiers: Krais, Krasnodar, Stavropol, *USSR(Georgian SSR).

A detailed description is given of some of the mineral springs of the Caucasus (Russian SFSR and Georgian SSR, USSR). Blue-green algae predominate in the springs studied. A small number of plankton forms are determined by the type of reservoir. The springs are shallow basins with running water, small streams and boils. Benthic algae predominate and form thick and loose films, coatings and accumulations. The type of film formed is determined by the morphology of the algae. The forms with a mucous cover form thick leathery films. Loose coatings and accumulations consist of nonmucilaginous algae. Thick films are found in reservoirs with rapidly flowing waters. The forms with a mucous cover prefer rapid waters, while the forms without vaginae prefer slow waters.--Copyright 1975, Biological Abstracts, Inc.
W76-06769

SEQUENCES OF EFFECTS OF A CITY SEWER: AS A FUNCTION OF THE REMOVAL OF THE SOURCE OF POLLUTION, ON THE PHOTOPHILE POPULATIONS GROWING IN EXPOSED PLACES (ALGAL FRACTION); FIRST RESULTS, (IN FRENCH),
Aix-Marseille-2 Univ. (France). Laboratoire de Biologie Vegetale.
T. Belsher.
Bull Soc Phycol Fr 19, p 158-163, 1974.

Descriptors: *Sewers, Vegetation, Algae, Cities, Europe, Water pollution sources, Bays, Harbors, Water pollution effects.
Identifiers: *France(Marseilles), Photophile, Populations, Ulvaceae.

The algal vegetation of the upper part of the infralittoral, in a polluted region near Marseilles (France), was investigated using new methods of phytosociology. This vegetation is characterized by a small number of species, an unusually small Margalef s index, and by the extreme scarcity of Ulvaceae. Near the sewer of Cortiou, Protofloridae form a dense cover on Corallina. This cover decreases westwards. Algal settlements growing in polluted areas are conspicuously different along open shores from those growing in sheltered bays and harbors.
W76-06770

CHLOROPHYLL A CONTENT AS AN INDEX OF PERIPHYTON PRODUCTIVITY, EXEMPLIFIED BY LAKE KRASNOE, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W76-06772

WATER POLLUTION AND ANTHROPOGENIC EUTROPHICATION OF INLAND WATER BODIES, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
L. L. Rossolimo.
Gidrobiol Zh 11(1), p 5-11, 1975.

Descriptors: *Eutrophication, Water pollution, Algae, Inland waterways, Plankton.
Identifiers: *Antrhopogenic disturbance.

The article deals with the difference between pollution and etrophication, the validity of including anthropogenic disturbances into the notion eutrophication and with some other problems important in principle. (Planktonic algae are discussed.)
W76-06775

THE MICROFLORA OF AEROBIC BACTERIA IN GRAVEL PIT LAKES, (IN GERMAN),
Sueddeutsche Versuchs- und Forschungsanstalt fuer Milchwirtschaft, Weihenstephan (West Germany). Bakteriologisches Institut.
K. Thurner, and W. Haber.
Arch Hydrobiol 75(3), p 347-365, 1975.

Descriptors: *Aerobic bacteria, *Lakes, Gravel, *Eutrophication, Ecological distribution.
Identifiers: Achromobacteria, Coryneform, *Gravel pit lakes, Pseudomonad.

A collection of 3300 aerobic bacteria was isolated from gravel-pit lakes of different age and ecological state. The bacterial flora was different in the various ecosystems. Coryneforms, pseudomonads and achromobacteria, in almost equal numbers, seem to be typical of unpolluted groundwater lakes. In a distinctly eutrophic lake with a high total-count, coryneforms were found at a much higher rate. In a 2nd eutrophic lake characterized by different ecological conditions, the bacterial floral consisted mainly of gram-negative bacteria. In the latter case the pattern of bacterial groups among gram-negative rods was different from the distribution found in the other lakes. Further studies are necessary to establish the ecological significance of these results.--Copyright 1975, Biological Abstracts, Inc.
W76-06777

THE EFFECT OF BACTERIAL SUBSTANCES ON THE GROWTH OF TWO CLADOPHORACIAE IN PURE CULTURE, (IN GERMAN),
F. Schanz, and E. A. Thomas.
Vierteljahrsschr Naturforsch Ges Zur 119(2), p 165-198, 1974.

Descriptors: *Eutrophication, *Cladophora, Algae, Growth rates, Cultures, Europe, North America, Lakes.
Identifiers: Agar, Europe, *Rhizoclonium, *Switzerland(Lake of Zurich), Thiamine, *Wisconsin.

The increasing eutrophication of European and North American waters has led to highly increased Cladophoraceae growth. Increasing amounts of water bacterium (S2) raised on plate-count agar increased the yield of Rhizoclonium clone R2, Cladophora 4 from the lake of Zurich (Switzerland) and Cladophora from Lake Mendota, Wisconsin (USA) when added to their culture water. Increasing amounts of water which covered the plate-count agar induced a similar increase in growth due to the yeast extract and trypton transferred from the plate-count agar to the water. Five bacterial clones from the Lake of Zurich were cultivated on glucose-glutamate agar which does not give off substances which promote the growth of Rhizoclonium and these bacteria produced substances which did agument algal growth. Maximal growth increase occurred when 3x10-9 g thiamine was added to 100 ml of culture water. Thiamine also significantly improved the growth of both Cladophora clones. Since corresponding amounts occur in natural waters, the thiamine content of a body of water is significant in determining the occurrence and mass development of Rhizoclonium and Cladophora. This is probably true for all Cladophoraceae.--Copyright 1975, Biological Abstracts, Inc.
W76-06779

HORIZONTAL DISTRIBUTION OF ZOOPLANKTON IN THE MINGECHAUR RESERVOIR, (IN RUSSIAN),
For primary bibliographic entry see Field 2H.
W76-06780

CONTINUOUS CULTURES APPLIED TO ECOLOGICAL RESEARCH, (IN FRENCH),
Institut National de la Recherche Agronomique, Thonon-les-Bains (France). Station d'Hydrobiologic Lacustre.
J. Feuillade, and M. Feuillade.
Bull Soc Phycol Fr 19, p 94, 1974.

Descriptors: *Culture, Ecology, *Lakes, *Stratification, *Epilimion, Nutrients, Plankton, Nitrogen, Phosphorus, Enzymes, Production.
Identifiers: Oscillatoria-Rubescens.

The epilimnion of a stratified lake can be compared with a culture functioning as a chemostat fed by 2 sources of nutritive elements: the affluent source and the hypolimnion. This method of continuous culture seems to be well adapted to ecological studies of lake plankton. Oscillatoria rubescens D.C., a frequent nuisance in eutrophic lakes, was studied. In the 1st experiment the N and P consumption of this species was studied. The rate of growth of the algae reaches equilibrium, a characteristic of the chemostat culture, when N or P reaches zero. Chemical and biological tests at this point show good correlation between N and P consumption and production of dry algal matter. The production of alkaline phosphatases depends on the P flow. The quantity of available P in the medium influences enzyme activity inversely. No relationship was found between phosphatase production and P extractible from the algae by boiling water.--Copyright 1975, Biological Abstracts, Inc.
W76-06782

STUDY OF THE PHOSPHATE METABOLISM OF A DRINKING WATER RESERVOIR, (IN GERMAN),
R. Hofmann.
Int Rev Gesamten Hydrobiol 60(1); p 63-95, 1975.

Descriptors: *Phosphates, *Metabolism, Potable water, Reservoirs, Water supply, *Primary production, Sediments, Europe.
Identifiers: Asterionella-Formosa, Fragilaria-Crotonensis, *East Germany(Saidenbach Reservoir).

A study was made of Saidenbach Reservoir, Erzebirge, East Germany. The phosphate supply for the planktonic primary production comes almost exclusively from the influxes. The nutrient pool in the hypolimnion and in the sediment does not play a leading part. Evidently, that is often so in reservoirs. Both the phytoplankton (the most frequent species are Asterionella formosa and Fragilaria crotonensis) and the concentration of phosphate fractions are subject to considerable seasonal variations. The Asterionella spring maximum, typical of this reservoir, is released directly or indirectly by meteorological factors. An adequate orthophosphate concentration is a basic condition which is accomplished nearly every year. the autumnal Fragilaria maximum begins when a definite mixing depth has been achieved. The breakdown of diatom maximum is amost always caused by exhaustion of the phosphate reserves.
W76-06785

THE EFFECT OF WATER TEMPERATURE OF THE INCUBATION TIME OF A PITUITARY INJECTION IN CARP (CYPRINUS CARPIO L.) UNDER FIELD CONDITIONS, (IN GERMAN),
Frieburg Univ. (West Germany). Limnologisches Institut.
H. Kausch.
Arch Hydrobiol Supplementb 47(3); p 413-422, 1975.

escriptors: *Water temperature, *Carp, Thermal ollution, *Spawning, Ponds, Fish reproduction.
dentifiers: Cyprinus-Carpio, Gonadotropin, Hor- one-Drug.

he incubation time of pituitary injection for in- uced spawning of the common carp (C. Carpio .) under pond culture temperature conditions uring may and early June in southern Germany an be linearly related to amient water tempera- re, using the equation y = 46,78 - 1,403 x, wher x temperature in centigrades, and y = time in ours. Carp and bream pituitaries give equal ef- cts. Administration of chorionic gonadotropin .H) at a dose of 100 IU/kg induces sper- atogenesis in the male carp.--Copyright 1975, iological Abstracts, Inc.
76-06787

ETROLEUM-OXIDIZING BACTERIA FROM HE GULF OF FINLAND, (IN RUSSIAN),
ep. Moscow State Univ. (USSR). Dept. of icrobiology.
V. Koronelli, Il'Inskii, and E. S. Kudrina.
ol Nauki 18(2); p 107-111, 1975.

escriptors: *Bacteria, Europe, Oxidation, Oil ollution, Oil spills, *Mycobacterium, *Oil wastes.
entifiers: Anthrobacter-Sp, *Gulf of finland, ycobacterium-Ceroformans, Mycobacterium- onvolutum, Mycobacterium-Hyalinum, ycobacterium-Mucosum.

om an oil slick collected near the shore of the ulf of Finland, petroleum-oxidizing bacteria re isolated which were identified as Mycobac- ium mucosum, M. convolutum, M. ceroformans rthrobacter sp.) and M. hyalinum. A description these microorganisms is given. The isolated cteria grow well on a medium with normal drocarbons or crude oil. A check of the ability the cultures to attack petroleum in a synthetic edium containing 1.1% crude oil as the sole or- nic substance established that oil is decomposed 070% by pure cultures and 80% by mixed cul- es.--Copyright 1975, Biological Abstracts, Inc.
76-06788

D. Waste Treatment Processes

SPOSAL OF SOLUBLE INORGANIC SALTS,
lsa Univ., Okla.
S. Manning, and N. D. Sylvester.
ailable from the National Technical Informa- n Service, Springfield, Va. 22161 as PB-251 556, 50 in paper copy, $2.25 in microfiche.
lahoma Water Resources Research Institute, llwater, Completion Report, (1974), 6 p. OWRT 047-OKLA(1).

scriptors: *Membranes, *Salts, *Dissolved ids, Ions, Waste water treatment, Separation hniques, Design, Construction, Desalination.
ntifiers: Hydrous oxide membranes, Laborato- low cell system.

namic hydrous oxide membranes, recently eloped at Oak Ridge National Laboratory, er the possibility of removing total dissolved ds and of separating monovalent ions from yvalent ones during concentration; thus creat- new possibilities for later steps such as frac- al crystallization. The goal of this research ject was the design and construction of a oratory flow cell system for the evaluation of e dynamic hydrous oxide membranes. The system has been designed, constructed, and luated on a preliminary basis. A schematic dia- n of the entire experimental flow system is sented.
6-06156

MARINE POLLUTION CONTROL: PART III--SHIP DESIGN REQUIREMENTS: THE DESIGN APPROACH,
Naval Ship Engineering Center, Hyattsville, Md. Environmental Pollution Control Branch.
A. E. Constant.
Naval Engineers Journal, Vol. 87, No. 5, p. 47-55, 1975. 4 fig, 3 ref.

Descriptors: *Oceans, *Water pollution control, *Ships, *Naval architecture, *Design, Waste disposal, Equipment, Solid wastes, Sewage treatment, Plumbing, Incineration, Oil wastes.
Identifiers: Compactors.

Techniques available to control shipboard generated wastes are discussed to stimulate interest in this area of ship design and to increase use of environmentally attractive systems and components. Correct location of pollution control equipment on ships will aid the crew and be less complicated and more economical to operate. Especially important are the needs for direct drainage flow and location of solid waste handling equipment. The discussion is directed to the Collection, Holding, and Transfer (CHT) systems. These systems are flexible, require only minor modification of existing plumbing, but require pier sewers or barging facilities, and entail only minor associated costs. There are two basic CHT systems. One uses a comminutor in the drain line into the holding tank, while the other uses an overflow box and inflow strainers. Incinerators, compactors, and food waste disposers needed to conform to regulations or requirements for shipboard generated solid waste disposal are described. The design for oil waste handling, stowage, transfer, and processing systems is discussed. Several suggestions are given for controlling oily ballast water. Residual oil should be removed from tanks and overflows from tanks arranged to prevent direct overboard discharge. (Buchanan-Davidson--Wisconsin)
W76-06196

UTILIZATION OF ANIMAL MANURES AND SEWAGE SLUDGES IN FOOD AND FIBER PRODUCTION,
Iowa State Univ. of Science and Technology, Ames. Council for Agricultural Science.
Report No. 41, February 1975. 27 p.

Descriptors: *Beneficial use, *Farm wastes, *Recycling, *Sewage sludge, Feeds, Fertilizers, Soil Amendments, Economics, Hazards, Sewage disposal, Salts, Sludge disposal, Agriculture, Heavy metals, Water pollution, Management, Land reclamation, Benefits, Public health, Crop response, Odor.

Proper use of animal manure and sewage sludges as fertilizers, soil additives, and animal feed could improve water and air quality and save fuel and feeds resources. Application to agricultural and forest lands is influenced by physical, chemical, microbiological, sociological, economic, political, and legal factors. Limitations to use as fertilizers are bulk, low quality, variable composition, inefficiency of application and expense of transportation. They may require drying, are difficult to store, and may contain large quantities of soluble salts (especially nitrates), heavy metals, pathogenic microorganisms, odors, etc. Fear of disease has hindered use of animal manure in animal feeds. Decreasing salts, trace metals, and bacteria accompanied by quality control would make these waste products more competitive with chemical fertilizers. Conservation of the ammonia produced and development of storage systems would be beneficial. Guidelines for use which are based on facts and acceptable risks and which can be interpreted in terms of local and regional conditions are needed to protect public health and environmental quality. Educational, research, and demonstration projects would improve management of sewage sludges and animal manures and would convince the population that their use can be beneficial. (Buchanan-Davidson--Wisconsin)
W76-06198

TECHNOLOGY AND $20 BILLION ADVANCE WASTEWATER TREATMENT EFFORT.
Engineering News Record, Vol. 195, No. 13, p. 18-19, 21-22, 24, 26, 29, 31. October 2, 1975. 5 fig, 1 tab.

Descriptors: *Water quality, *Sewage treatment, *Waste water treatment, *Sewage effluents, *Tertiary treatment, Filtration, Reverse Osmosis, Activated carbon, Phosphorus, Nitrogen, Biochemical Oxygen demand.
Identifiers: Water Pollution Control Act of 1972.

About $24.8 billion needs to be spent to treat the 30 billion gallons of wastewater which will be produced each day in the US by 1990. The technology to provide Advanced Waste Treatment (AWT) is available but the costs are high and there is also a backlog of secondary treatment projects designed to meet somewhat lower effluent standards which must be met by 1977. Problems must be approached on a case by case basis. Nature of the influent waste and receiving streams, and other factors are important. AWT can replace biological treatment with physical and chemical processes or it can refine secondary effluent. Removal of phosphorus has received top priority and is less expensive than removal of other wastes. Removal is accomplished by using lime, alum, or ferric chloride at one of several points in the treatment process. The additive reacts to form a solid which precipitates. Nitrogen removal is more difficult and more often questioned, though this element can be toxic to fish, corrode copper and increase chlorine consumption in disinfection. Removal of dissolved organics is accomplished with activated carbon, and is also possible through ozone oxidation though it is more expensive. However, this is less expensive than reverse osmosis, a process which removes almost all pollutants by forcing wastewater through a semi-permeable membrane of cellulose acetate. This is a high energy system useful in some industrial settings only. No single system can accomplish all treatment goals and the basic engineering involved is evolutionary not revolutionary. Costs are putting a severe strain on development. Prospect of meeting the zero-discharge objective of the Water Pollution Control Act of 1972 is dim. (Smith - North Carolina)
W76-06271

IMPACT OF THE SEWAGE WORKERS' STRIKE ON THE RIVER CLYDE,
Clyde River Purification Board, Glasgow(Scotland).
For primary bibliographic entry see Field 5C.
W76-06281

UPGRADING PRIMARY TREATMENT WITH CHEMICALS AND WATER TREATMENT SLUDGE,
Greeley and Hansen, Chicago, Ill.
T. E. Wilson, R. E. Bizzarri, T. Burke, P. E. Langdon, and C. M. Courson.
Journal Water Pollution Control Federation, Vol. 47, No. 12, p 2820-2833, December, 1975. 12 fig, 7 tab.

Descriptors: *Waste water treatment, *Suspended solids, *Biochemical oxygen demand, Coagulation, Nutrient removal, Polymers.
Identifiers: Chemical treatment, Sludge handling, Alum, Phosphorus removal.

In order to upgrade the quality of effluent water in Tampa, Florida, a study was undertaken to develop a chemical treatment program and a sludge handling program. A preliminary laboratory screening of processes indicated that a combination of alum and high-molecular weight anionic polymer woold be a promising coagulant. Other preliminary studies indicated that suspended

solids (SS) removal could be correlated with phosphorus removal and that there was a relationship between alum dosage and effluent SS concentration. During the main study alum and polymer were added to the influent on a 24 -hr/day basis and the alum was paced according to the orthophosphorus concentration. This concentration was about 2 mg/liter, corresponding to an estimated effluent SS concentration of about 30 mg/liter. The effluent SS remained below 30 mg/liter when the effluent orthophosphorus was below about 1.6 mg/liter. When chemicals were added the percentage removal and effluent concentrations of BOD and SS were superior to those when no chemicals were added. Because laboratory tests indicated that addition of water works sludge should improve performance and SS removal, it was attempted. Each time sludge was discharged to the system, performance suffered. It was then hypothesized that the sludge was being taken at too high a rate, and, upon regulation, the sludge was accepted. At times of high waste water flow or low water works sludge discharge, alum was necessary to maintain high removal efficiencies. The resulting raw sludge was slightly lower in solids content but no other significant changes from previous operation were noted. (Loustau-FIRL)
W76-06286

AN ECONOMIC STUDY OF THE UNOX AND CONVENTIONAL AERATION SYSTEMS,
J. M. Sidwick, T. P. Lewandowski, and K. H. Allum.
Water Pollution Control, Vol. 74, No. 6, p 645-656, 1975. 5 fig, 3 tab, 3 ref.

Descriptors: *Aeration, *Activated sludge, *Oxygenation, *Operating costs, *Capital costs, Biological treatment, Sewage treatment.
Identifiers: UNOX system.

The cost of the Unox treatment system was compared with conventional aeration systems. The Unox system differs from the activated sludge process primarily in that oxygen-enriched air is the source of oxygen for the microorganisms in the aeration tank. Although the process has been known for a long time, it was thought to be impractical cost-wise. A system using a staged reactor and a covered tank in such a manner as to achieved 90% utilization of the generated oxygen gas was linked up with an oxygen-production unit employing molecular sieves. The new system, the basis of the Unox system, allowed comparatively low cost production of oxygen in small tonnage requirements. Process parameters of the Unox system and the conventional activated-sludge system are given and the capital and operating costs are then compared. The total capital costs of the Unox plant were lower throughout the range of flows and treatment systems considered, but the operating costs were higher for the Unox system. The lowest plant capital costs resulted from treating unsettled sewage. The higher operating costs when operating on unsettled sewage offset any gains in reduced capital expenditure on these plants. Circular Unox treatment units were cheaper than rectangular for most of the systems considered. The Unox system offered a treatment process which was directly competitive with conventional aeration processes throughout the plant range studied. The process would be best operated on settled sewages in the United Kingdom to avoid any problems with sludge disposal. (Loustau-FIRL)
W76-06288

NOVEL AERATION SYSTEM BOWS,
Imperial Chemical Industries Ltd., Billingham (England). Agricultural Div.
D. A. Hines, M. Bailey, J. C. Ousby, and F. C. Roesler.
Water and Wastes Engineering, Vol. 12, No. 12, p 59-64, December, 1975.

Descriptors: *Aeration, *Waste water treatment, *Biological treatment, Separation techniques, Microorganisms, Activated sludge, Pilot plants.
Identifiers: Deep shaft.

A new aeration process for effluent treatment has been developed as a spin-off from basic aerobic fermentation technology for single cell protein development. Using a deep shaft, the process operates as a modified air-lift fermenter with air injection and may be used for municipal or industrial waste of any strength. It differs from the single cell protein production technology in that the air-lift type of fermenter not only provides biological oxidation but also provides the driving force for liquid circulation. A deep shaft, partitioned into two sections, forms the basis of the process design. Liquid effluent enters the apparatus continuously and is circulated by air pressure many times around the shaft during its time in the system. It then overflows by gravity for solids separation. To establish the effect of pressure oscillations on microorganisms in the activated sludge, a simple experiment was carried out. Nitrogen sparged at varying pressures through a vessel half-filled with activated sludge produced no decrease in viability or respiratory activity of the sludge. Electron micrograms and investigation by light-microscopy showed no evidence of cell rupture. Results from the deep shaft pilot plant have confirmed the validity of these initial experiments. The advantages of the deep vertical shaft are the minimal land requirement, the elimination of primary settlement, less sludge for disposal, the easily-supplied oxygen requirement, and the possible combination of activated sludge and aerobic digestion duties in a single shaft. (Loustau-FIRL)
W76-06289

MOVING BED FILTER PERFORMANCE STUDIES,
Research Triangle Inst., Research Triangle Park, N.C.
F. O. Mixon.
Chemical Engineering Progress, Vol. 71, No. 12, p 40-46, December, 1975. 6 fig, 2 tab, 5 ref.

Descriptors: *Filters, *Filtration, *Sewage treatment, *Waste water treatment, Equipment, Suspended solids, Recycling, Cleaning, Flow rates.
Identifiers: Moving bed filter.

The advantages of a new moving bed filter in treating both raw sewage and secondary effluents is that the filter medium is continually removed, cleaned, and recycled to the filtration zone. This moving bed contactor process should compete with and perhaps replace clarification, fixed bed filtration, microscreening and moving bed filters of countercurrent or crosscurrent design. The advantages of the moving bed contactor are that the equipment is simple, the filter can handle high and low suspended solids concentrations, the continuous operation feature simplifies materials handling and process automation, there is an inherent headloss stability, and its mechanism is analogous to graded filter media. In this moving bed process, the filter medium is slurried with incoming process feed and fed to the bottom of the moving bed contactor. Once inside, the filter medium rises because of buoyancy and viscous drag to the bottom of the performed porous plug of filter medium where it is deposited and thus replenishes the porous plug. Water is forced through the plug and is discharged by gravity at the lateral retaining screens, simultaneously undergoing filtration and forcing the plug slowly upward. At the top of the column, the emerging porous plug is harvested by a mechanical scraper and discharges filter medium into an auxiliary tank from which it is washed and returned to the process. After a year's testing, data showed that from 62 to 82% of the suspended solids in raw sewage was removed by the moving bed unit at flow rates ranging from around 3.5 to 7.5 gal/min/sq ft. (Loustau-FIRL)
W76-06290

CAERNARFON SLUDGE GOES UP IN SMOKE,
For primary bibliographic entry see Field 5E.
W76-06291

SLUDGE DISPOSAL ALTERNATIVES,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5E.
W76-06292

THERMOPHILIC MICROBIOLOGICAL TREATMENT OF HIGH STRENGTH WASTE-WATERS WITH SIMULTANEOUS RECOVERY OF SINGLE CELL PROTEIN,
Illinois Univ. at Urbana - Champaign. Dept. of Civil Engineering.
G. A. Surucu, R. S. Engelbrecht, and E. S. K. Chian.
Biotechnology and Bioengineering, Vol. 17, No. 11, p 1639-1662, November, 1975. 10 fig, 3 tab, 38 ref.

Descriptors: *Waste water treatment, *Kinetics, *Aerobic conditions, *Thermophilic bacteria, *Biological treatment, Model studies, Chemical oxygen demand, Proteins, Biomass.
Identifiers: Solids retention time.

To determine the kinetic and operating parameters of a thermophilic system of waste water treatment, the kinetic coefficients of an aerobic thermophilic mixed culture system were calculated, the effects of solids retention time (SRT) on the biomass was demonstrated, and the economics of protein recovery were assessed. A mixed culture of thermophilic organisms from soil, streams, waste water, and silage was prepared and studied for various growth characteristics at 58 C in a medium containing glucose, the carbon source, and other nutrients. The biomass was then measured for cell mass, COD, and protein content. A series of experiments were performed at eight different SRT values. The resulting data were then applied to the Monod kinetic model. The kinetic parameters of saturation constant, substrate utilization rate, and death rate for a thermophilic system were much higher than those of a mesophilic system, while the yield coefficient was somewhat lower. Over 90% removal of soluble COD was observed with a SRT of two days and it improved with increasing SRT. The protein content of the biomass increased as the dilution rate decreased. However, because of a significant increase in the apparent cell yield with higher dilution rates, the net protein yield was found to increase with increasing dilution rates. A decrease in oxygen consumption per unit quantity of protein produced with increasing dilution rates also favored the economics of protein production. (Loustau-FIRL)
W76-06293

A TECHNIQUE FOR ESTIMATING ACTIVE NITRIFYING MASS AND ITS APPLICATION IN DESIGNING NITRIFYING SYSTEMS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-06296

STATISTICAL DESIGN OF EQUALIZATION BASINS,
Hydroscience, Inc., Westwood, N.J.
D. M. Di Toro.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 101, No. EE6, p 917-933, December, 1975. 12 fig, 1 tab, 10 ref.

Descriptors: *Design criteria, *Statistical analysis, flow rates, *Waste water treatment.
Identifiers: *Equalization basins.

The major design problem in smoothing out fluctuations of concentration and mass flow rate in

equalization basin is to relate the characteristics of the fluctuating influent to those of the equalized effluent, as a function of the detention time. Presented here are the results and conclusion of two types of characterizations of the influent in graphical and tabular form suitable for design purposes. An analysis presented in subsequent sections addresses the questions of what are the statistics of the effluent concentration and effluent mass flow rate, and what is the probability that the effluent concentration exceeds a given design value. It is concluded that the equalization basin is a device that can be used to control variability in much the same way that conventional treatment units control mean values. As a post-treatment device, an equalization basin may be designed to meet variability criteria that would be difficult to achieve in the reactive units of the system. (Loustau-FIRL)
W76-06297

OMPUTERIZED MONTHLY REPORTS, OST-EFFECTIVE ALTERNATIVE,
lassachusetts Univ., Amherst. Dept. of Civil Engineering.
or primary bibliographic entry see Field 7C.
76-06300

HE EFFECT OF SOME CARBON SUBTRATES ON MORPHOLOGY OF FLOCS AND UANTITATIVE RELATIONS AMONG ICROORGANISMS IN ACTIVATED SLUDGE,
arsaw Univ. (Poland). Zaklad Microbiologica ody Sci.; and Warsaw Univ. (Poland). Dept. of ater and Sewage Microbiology.
Bieszkiewicz, and E. Lapies.
cta Microbiologica Polonica, Vol. 7, No. 1, p 55-, 1975. 3 tab, 7 ref.

escriptors: *Activated sludge, *Sewage, *Waste ater treatment, Microorganisms, Bacteria, Measrement, Analytical techniques.
entifiers: Carbon substrates, Glucose, Sodium etate, Gallic acid, Flocs.

e effect of glucose, sodium acetate, and gallic d substrates on microorganisms of activated dge were studied. A synthetic activated sludge s cultured in sewage for four weeks and sams were removed every three days. Each sample s measured for the number and size of flocs; for number of flagelleta and the number of freeng, creeping, and settled ciliata by the direct unt method and the plate method; for volume ex; and for oxygen demand. Great differences re found in the appearance, size, and number of cs of the activated sludge cultures. In the sludge tured with sodium acetate, the flocs were nified. In the culture with glucose, the flocs re irregular and had folded margins and fine-in structure. In the gallic acid culture, the flocs re of a similar appearance but were much aller and twice as numerous. A greater number acteria were aggregated in the acetate and glue sewages than in the gallic acid sewage. The nber of free-living bacteria declined in the tate sewage, but remained constant in the glue sewage. In the gallic acid culture the number ree-living bacteria was greater than that of the regated organisms for the whole period of exment. Flagellata, which developed in the early of the experiment, decreased as settled ciliata eased. Purification of the glucose sewage hed 76%, that containing sodium acetate, , and that containing gallic acid, 61%. ustau-FIRL)
-06302

MIUM AND ZINC CONTENTS OF CORN F AND GRAIN PRODUCED BY SLUDGE-ENDED SOIL,
is Univ. at Urbana-Champaign. Dept. of nomy.
primary bibliographic entry see Field 5A.
-06304

A FEW CONSIDERATIONS ON THE MEASUREMENT OF PORE SIZE DISTRIBUTION OF ACTIVATED CARBON (KASSEITAN NO SAIKOKEI BUNPU SOLUTEI NI KANSURU 2,3 NO KOSATSU),
S. Sato, K. Najima, K. Yoshikawa, and Y. Inagaki.
Mitsubishi Juko Giho, Vol. 12, No. 5, p 535-542, 1975. 14 fig, 5 tab, 12 ref.

Descriptors: *Waste water treatment, *Analytical techniques, *Activated carbon, Water treatment, Adsorption.
Identifiers: Pore size distribution, Activated carbon microstructure.

Increasingly stringent pollution control standards and the demand for the reuse of water have increased the use of activated carbon for waste water treatment. A study of the microstructure of activated carbon is important since the microstructure is closely related to the adsorbing performance of the carbon. The nitrogen adsorption method and the mercury pressure-penetration method were used to study the microstructure of activated carbon. The accuracies of these methods and analytical procedures are discussed. Measuring techniques for specific surface area, pore volume, and pore size distribution were established. Results from the investigations of the pore size distribution of activated carbon used for water treatment have shown that these analytical techniques can be used as important evaluating means for virgin carbon, spent carbon, and regenerated carbon. (Orr-FIRL)
W76-06309

GOVERNMENT-CONTRACTOR-ENGINEER LIASON THAT CREATES AN ECONOMICAL PROJECT,
For primary bibliographic entry see Field 5F.
W76-06319

WATER QUALITY MANAGEMENT FOR METROPOLITAN KANSAS CITY,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5G.
W76-06323

DEALING WITH THE DISCHARGE MONITORING REPORT,
San Antonio Wastewater Treatment Plant, Tex.
For primary bibliographic entry see Field 5G.
W76-06325

HEALTH SIGNIFICANCE OF AIRBORNE MICROORGANISMS FROM WASTEWATER TREATMENT PROCESSES, PART I: SUMMARY OF INVESTIGATIONS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W76-06326

HEALTH SIGNIFICANCE OF AIRBORNE MICROORGANISMS FROM WASTE WATER TREATMENT PROCESSES, PART II: HEALTH SIGNIFICANCE AND ALTERNATIVES FOR ACTION,
North Carolina Univ., Chapel Hill. Dept. of Environmental Science and Engineering.
For primary bibliographic entry see Field 5C.
W76-06327

CONTROLLING POLLUTION FROM COMBINED SEWERS,
Hydrocomp, Inc., Palo Alto, Calif.
R. K. Linsley.
Simulation Network Newsletter, Vol. 7, No. 5, p 1-4, July 1, 1975. 4 fig.

Descriptors: *Storage capacity, *Sewage treatment, *Hydrology, Economics, Model studies, Economics, Flow, Simulation analysis, Flood control, Planning.
Identifiers: Hydrocomp Simulation Program(HSP).

If the 1985 target for pollution control is to be met, billions of dollars must be spent for storage facilities for sewage flows awaiting treatment. Determination of the required storage capacity is a hydrologic and economic problem. The Hydrocomp Simulation Program (HSP) is a continuous flow simulation that can give the most accurate estimates for storage requirements and configurations possible. HSP can also define the probability that the discharge of pollutants into receiving waters would exceed limits. If they did not, storage could be reduced. Since such probabilities would vary, even within the period of a day, the program must be produced very rapidly and accurately. The principle of flow storage is similar to that of flood control by reservoirs. The major differences are that the projected costs of flow storage are three times the expenditures to date on flood control, and that there are few records of sewer flows that can be used for design purposes. These factors necessitate the use of careful planning from simulated models. (Loustau-FIRL)
W76-06328

PHOSPHATE SORPTION CHARACTERISTICS OF SOILS TREATED WITH DOMESTIC WASTE WATER,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 5B.
W76-06330

MANAGEMENT OF AN EFFECTIVE MAINTENANCE PROGRAM,
California State Univ., Sacramento. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-06333

NUTRITIONAL AND PHYSIOLOGICAL EFFECTS OF NITRATES, NITRITES, AND NITROSAMINES,
Florida Univ., Gainesville. Dept. of Animal Science.
For primary bibliographic entry see Field 5C.
W76-06334

EFFECTS OF SALINITY ON NITRIFICATION IN THE EAST RIVER,
New York State Dept. of Health, Albany. Div. of Labs. and Research; New York State Dept. of Health Albany. Environmental Health Center.
For primary bibliographic entry see Field 5C.
W76-06335

FULL AUTOMATION GOAL OF WATER RECLAMATION PLANT,
Brown and Caldwell, Inc., Walnut Creek, Calif. Process Control Div.
M. J. Flanagan.
Water and Wastes Engineering, Vol. 12, No 12, p19-24, 58, December, 1975. 5 fig, 3 tab.

Descriptors: *Computers, *Data processing, *Control systems, Treatment facilities, Waste water treatment, Water reuse, Biological treatment, Automatic control, Construction costs.
Identifiers: Water reclamation plant, Physico-chemical treatment.

A system of distributed digital processors and peripheral equipment is employed for data acquisition, process control and data management in a new 30 mgd water reclamation plant. The process control and management information system is

currently undergoing factory testing prior to delivery to the plant site. The entire digital system was connected to an analog computer programmed on a real time basis to simulate portions of the waste water treatment process. The system is built around a hierarchical network of digital computers consisting of two minicomputer systems and 24 microcomputer systems. The cost of the system, including all field instrumentation and telemetry equipment, represents 4.0% of the total plant construction cost. The system can be expanded whenever the plant is expanded. Both computer systems are provided with a real-time operating system so that either system can be assigned to real-time process control. The computers will regulate the functions of the plant processes, log operational data, schedule a maintenance program, keep an inventory, assign personnel, and store and retrieve historical data. The alarm system works in such a way that the operator is only informed of abnormal functioning. The plant in which the computer system will be installed is a physical-chemical-biological process and incorporates lime clarification in the primary sedimentation tanks, biological nitrification-dentrification, and a two-stage centrifugal classification and clarification process with recalcining and lime recovery. The denitrified plant effluent is filtered by a multimedia rapid sand filtration system and chlorinated prior to distribution for reuse by industry. (Loustau-FIRL)
W76-06337

PRACTICAL RESEARCH IN WATER POLLUTION CONTROL,
University Coll., Cardiff (Wales). Dept. of Microbiology.
C. F. Forster.
Water Pollution Control, Vol. 74, No. 6, p 625-634, 1975. 7 fig, 5 tab, 24 ref.

Descriptors: *Waste water treatment, *Research and development, Activated sludge, Treatment facilities, Bacteria, Water pollution control, Nitrification, Sludge disposal.

Relative to problems in the waste water treatment industry, particularly aspects of sludge bulking, nitrification, and sludge disposal, some current fields of research are discussed. The settling characteristics of sludge have a considerable influence on the quality of final effluent. Deterioration in the settling properties of activated sludge, or bulking, is an ever-present threat to treatment plants. There are two theories on the causes of bulking: one is that a bulked sludge is one that has become grossly infected by filamentous microbes, and the other is that bulking is due to variations in the surface of the sludge. As a result of studies based on the latter theory, it has been suggested that the accumulation of lysozyme sensitive material in the sludge caused by the death of bacteria could be one cause of bulking. Another cause could be the depolymerization of slime layer polysaccharide. Since present standards for discharge are inadequate and the amount of nitrogenous matter converted to ammonia must be minimized, nitrifying systems are being studied. One solution calls for a separate nitrifying system in which the biomass is composed more or less exclusively of nitrifying bacteria and in which the sludge age is high. Another solution is submerged filtration in which there is a co-current flow of liquid and air upwards through a packed bed upon which the nitrifying flora develops. For the disposal of waste sludge, two possibilities show commercial potential. One use is the supplementation of animal feed, and the other is conversion into fermentation feedstock. (Loustau-FIRL)
W76-06340

ZERO DISCHARGE TO THE ENVIRONMENT OF DIFFICULT WASTEWATERS,
M. A. Elshazly.
In: Complete WateReuse: Industry's Opportunity, April 23-27, 1973, American Institute of Chemical Engineers and Environmental Protection Agency--Technology Transfer, p 147-151. 1 fig.

Descriptors: *Waste water(Pollution), *Waste water disposal, *Waste water treatment, *Chemical wastes, Industrial wastes, Oil, Costs, Incineration, Evaporation, Organic matter, Ultimate disposal, Water reuse.
Identifiers: Carver-Greenfield process, Waste streams, Multi-evaporation process, Zero discharge.

Contaminated waste waters from the chemical processing industry vary so much in composition that treatment by chemical or biological methods is very difficult. Such wastes were previously dumped in deep wells, dumped in the ocean, or incinerated. A multi-evaporation process, called the Carver-Greenfield process, has been used in the food processing industry successfully and is now finding application in the recycling and ultimate disposal of chemical wastes. Oil is added to the liquid waste and the water is evaporated. The resulting moisture free oil-solid suspension is separated by centrifugation. Since tighter environmental standards have made the cheaper methods of disposal ecologically unsound, the Carver-Greenfield process previously considered too costly, is becoming a viable alternative. Two types of waste streams are considered. The first is 20,000 lbs/hr with 7% dissolved organic material from a pharmaceutical manufacturer, and the second is 117,000 lbs/hr, containing 9% oil and 3% solids from an oil refinery. In the first plant, incineration was adopted at a cost of 169,000 dollars. If the Carver-Greenfield process were used, it would cost 92,000 dollars per year. In the second plant, incineration costs 1,018,500 dollars, while the Carver-Greenfield process costs 350,000 dollars. (See also W76-05314) (Pinto-FIRL)
W76-06341

HOW TO IMPROVE PLANT EFFICIENCY,
Environmental Protection Agency, Washington, D.C. Office of Water Programs Operations.
For primary bibliographic entry see Field 5G.
W76-06342

REVEGETATING BITUMINOUS STRIP-MINE SPOILS WITH MUNICIPAL WASTEWATER, PART II: QUALITY THE LEACHEATE AND SPOIL CHEMICAL CHANGES,
Pennsylvania State Univ., University Park. Dept. of Forest Hydrology.
B. R. Edgerton, W. E. Sopper, and L. T. Kardos.
Compost Science, Vol. 16, No. 5, p 10-15, Autumn, 1975. 1 fig, 4 tab, 5 ref.

Descriptors: *Waste disposal, *Sludge disposal, *Toxicity, *Land reclamation, Model studies, Environmental effects, Irrigation, Leachates, Nitrogen, Waste water(Pollution), Eutrophication.
Identifiers: Renovation, Acid mine drainage, Land application.

Stripmining causes acid mine draining that can result in a sterile aquatic ecosystem. In order to try to ameliorate the toxicity and acidity of strip-mine spoil, a study was conducted on the changes effected by effluent and sludge irrigation on spoil material. In a model study, boxes of highly toxic spoils were planted with legume and grass seeds, and irrigated with amounts of effluent and sludge. Upon analysis of spoil and leachate chemical composition, it was found that effluent and sludge treatment of the spoil material could ameliorate the conditions of toxicity and acidity. Leachate nitrogen levels may be increased, however, resulting possibly in detrimental eutrophication of waterways. (See also W76-03821) (Loustau-FIRL)
W76-06343

ANAEROBIC DIGESTION OF SLUDGE, PART II,
Pirnie (Malcolm), Inc., Paramus, N. J.
A. F. Weland, and P. N. Cheremisinoff.
Water and Sewage Works, Vol. 122, No. 11, p 45-47, November, 1975. 3 fig, 1 tab, 30 ref.

Descriptors: *Design criteria, *Anaerobic digestion, *Biological treatment, Waste water treatment, Alkalinity, Toxicity, Equations, Kinetics, Sludge treatment.
Identifiers: Solid retention time.

The design parameters of anaerobic digestion are reviewed, with emphasis placed on specific advantages and disadvantages of the process. The physical parameters of anaerobic digestion are detention time, temperature, influent solids concentration, mixing, and solids loading. Temperature and detention time are interrelated. If bacterial growth is stimulated by temperature, the stabilization rate increases. Solids retention time is generally 10 to 15 days. Solids retention time (SRT), solids loading, and volatile solids concentration are also interrelated. If solids loading is 0.10 lb VSS/cu ft/day and SRT is 10 days, then a minimum of 1.5% volatile solids is required. The chemical parameters of anaerobic digestion are pH, alkalinity, volatile acid, nutrients, and toxic materials. Alkalinity and pH are interrelated. Ideal environmental conditions are pH values of 6.6 to 7.4. The ratio of volatile acids to total alkalinity should be approximately 0.5. Sludges from sewage treatment plants and meat packing houses contain all the necessary nutrients, but wastes containing carbohydrates of fats require additional nutrient or seed materials. Industrial wastes are usually the cause of toxicity. This may be eliminated or reduced by dilution, precipitation, use of antagonist ions, process by-pass, or process modification. An equation was developed for the kinetics of digestion. The development of high rate systems has improved the overall efficiency of anaerobic digestion, but recent advances in incineration processes indicate a trend toward the replacement of the digestion process. (See also W76-03827) (Loustau-FIRL)
W76-06344

DETERGENT PHOSPHATE BAN YIELDS LITTLE PHOSPHORUS REDUCTION, PART II,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W76-06345

DETERGENT PHOSPHATE BAN YIELDS LITTLE PHOSPHORUS REDUCTION, PART III,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W76-06346

INSTRUMENTS FOR WATER AND SEWAGE TREATMENT PLANTS (JOGESUIDO KEISOKIKI),
Tokyo Shibaura Electric Co., Ltd. (Japan).
For primary bibliographic entry see Field 7B.
W76-06347

EVALUATION OF IN-LINE AND SIDE-LINE FLOW EQUALIZATION SYSTEMS,
G. W. Foess, J. G. Meenahan, and D. Blough.
Water and Sewage Works, Vol. 122, No. 11, p 59-60, November, 1975.

Descriptors: *Waste water treatment, *Treatment facilities, Biochemical oxygen demand, Municipal wastes, Flow, Evaluation.
Identifiers: *Flow equalization.

Despite advantages ascribed by various investigators, flow equalization has not been widely applied in the municipal pollution control field because of uncertainties in the areas of costs and beneficial effects. Two waste water treatment facilities, one employing side-line equalization, and the other employing in-line equalization, were evaluated for

mpact on waste water characteristics, treatment rocess performance, and plant operating costs. oth equalization systems were highly effective in moothing influent flow variations and providing a niform flow rate to the process units. However, ontrary to previous statements, each system exibited only limited effectiveness in concentration veling. A five percent BOD reduction was noted ross the in-line basin. Overall removal of soluble hosphorous and effluent quality appeared to be naffected by flow equalization. (Loustau-FIRL)
76-06348

CTIVATED BIO-FILTER PROCESS,
. F. Owen, and A. F. Slechta.
ater and Sewage Works, Vol. 122, No. 11, p 60, ovember, 1975.

escriptors: *Biological treatment, *Filters, iltration, Microorganisms, Ammonia, iochemical oxygen demand, *Waste water treatent, *Activated sludge.
entifiers: Cost-effectiveness, *Bio-filters.

e two-stage activated bio-filter process, emoying both fixed film and activated sludge ological reactors, is a new development in seconry treatment. The ABF is unique in that fixed d suspended growth microorganisms are utilized the first-stage reactor, called the 'bio-cell'. The ocess includes a bio-cell lift station, a fixed film actor, flow control and splitting, a short detenn aeration basin, a clarifier, and return sludge cilities. In a trial run at Corvallis, Oregon, the BF system, with an influent NH3-N concentran of 45 mg/liter and a bio-cell loading of 350 lbs OD day/1,000 cut ft, removed over 90% BOD d ammonia. The ABF can be applied for any ological waste treatment system. Low power and d use requirements make it suitable for muipal treatment plants. Standard techniques are ed in design, construction, and operation of the BF system. It has been shown to be cost-effece because the efficiency of the first-stage treatnt necessitates only a small second-stage aeran basin. (Loustau-FIRL)
6-06349

GIONAL WASTE WATER DEVELOPMENT AN: ANALYSIS OF EXISTING FACILITIES.
mo Area Council of Governments, San Anio, Tex.
l. Parts I, II, III. Various Paging. 30 fig, 2 tab.

scriptors: *Regional development, *Waste atment, *Quality control, Water quality, Waste posal, Water analysis, Basins, Sanitary eneering, Biochemical oxygen demand, *Texas, eatment facilities, *Waste water treatment.
ntifiers: *San Antonio(TX), Cibolo Creek(TX).

43 waste treatment facilities within the San onio AACOG planning region have been lyzed by design criteria of the Texas State Dement of Health. Plant design, component and rall capacities, and effluent quality sampling lts for each plant are reported. It is recomded that the 19 treatment plants within the posed City of San Antonio Regional System be solidated to 3 facilities, and that the remaining lants be phased out. Extensive sampling dur- the past 6 months indicates that there is espread inadequacy in treatment. The Texas er Quality Board has set standards for maxn allowable BOD (Biological Oxygen Dd) at 27 mg/l and TSS (Total Suspended ds) at 27 mg/l on any grab sample of processed ent. These standards were exceeded in almost of the BOD tests and almost 60% of the TSS . It is also proposed that wastewater from the nts in the Cibolo Creek water-shed be cold and treated at two regional plants to be ated by the San Antonio River Authority. pling at these six plants shows that BOD stans are being exceeded in 40% of the samples TSS are above the standards in 70% of the samples. The remaining 17 plants in the region consist of 15 serving small rural communities and 2 operated by the US government. These facilities will not be made part of the regional system within the next few decades, although almost 90% of these facilities fail to meet the standards half the time, indicating a need for improved levels of treatment. (Herr - Carolina)
W76-06351

SEWER/WATER PREFERRED LONG RANGE PLANS.
Northern Middlesex Area Commission, Lowell, Mass.
For primary bibliographic entry see Field 5G.
W76-06352

SEWER AND WATER FACILITIES IN THE NORTHERN MIDDLESEX AREA, SHORT RANGE PRIORITY PROGRAM 1972-1977.
Northern Middlesex Area Commission, Lowell, Mass.
For primary bibliographic entry see Field 5G.
W76-06353

LAND DISPOSAL OF SEWAGE SLUDGE, VOLUME I (NOVEMBER 1972 - MARCH 1973).
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 5E.
W76-06365

MINE AND MILL WASTEWATER TREATMENT.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
Environmental Protection Service, Economic and Technical Review Report EPS 3-WP-75-5, December 1975, 141 p, 30 fig, 23 ref, 19 tab.

Descriptors: *Effluents, *Mills, *Mine water, Wastes, Mine drainage, Runoff, Comsumptive use, Treatment facilities, Water pollution, Metals, Mining, Wastes, Costs, Acid mine water, Canada.
Identifiers: *Tailings, Canadian practice.

This report reviews the origin of water borne wastes (mine drainage, mill process effluent and surface runoff) encountered in metal mining and milling operations, and the associated chemical processes resulting in contaminated effluents. It deals with the types of contaminants normally encountered in wastewaters discharged from the industry and the technology currently employed for the abatement and control of water pollution. The design and operation of the most widely used treatment facility, the tailings pond, is covered in some detail. Treatment of acid mine water in the newer mechanical treatment systems is also reviewed, particularly with reference to the 5 lgpm pilot plant project recently completed at the Brunswick Mining and Smelting Company. One section deals with the economic impact of effluent treatment on the mining industry. The costs of constructing and operating sound environmental control systems are discussed. The data and method suggested for deriving such costs should prove helpful to professionals involved in the estimation and control of environmental protection costs. Several case studies covering treatment costs are included. (Environment Canada)
W76-06373

REMOVAL OF PHOSPHATES AND METALS FROM SEWAGE SLUDGE,
Waterloo Univ. (Ontario). Dept. of Chemical Engineering.
D. S. Scott, and H. Horling.
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 28, Training and Technology Transfer Division (Water), Environmental Protection Service, Environment Canada, Ottawa, Canada, (1973) 55 p., 11 fig., 19 ref., 8 tab. 73-5-7.

Descriptors: *Phosphates, *Sewage, Metals, Iron, Sludge, Heavy metals, Aluminum, Costs.
Identifiers: *Metal extraction, Organic material.

Most of the metals and phosphorus in either unconditioned or conditioned final anaerobically digested sludges can be readily extracted by acid. The acid extract can be neutralized under controlled conditions of pH to yield a solid product low in organic material containing mostly iron and aluminum phosphates. By proper control of pH, it is possible to produce two solid products, one containing most of the iron and aluminum, and one containing most of the heavy metals. Iron and phosphate can be separated and recovered from the crude inorganic product by known solvent extraction technology, or by alkali treatment. Costs are such that if metals and phosphates are removed from a sludge, then it is profitable to recover and recycle the iron and phosphate from the crude inorganic product. However, the value of recovered metals and phosphates is not sufficient to bear the cost of the entire process. (Environment Canada)
W76-06375

A MODEL TO PREDICT THE PERFORMANCE OF FEEDLOT RUNOFF CONTROL FACILITIES AT SPECIFIC OREGON LOCATIONS,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-06382

PROCESS OF REMOVING AMMONIACAL NITROGEN FROM WASTE WATER,
Iwao Engineering Co., Inc., Tokyo (Japan). (Assignee).
T. Hiasa, and H. Ishimard.
U.S. Patent No. 3,929,600, 9 p, 1 fig, 6 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 941, No 5, p 2224, December 30, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water pollution control, Water quality control, Ammonia, *Nitrogen compounds, Nitrogen, Chlorine adsorption, Electrolysis, Ion-exchange, Hydrogen ion concentration, Separation techniques, Chemical reactions.
Identifiers: *Ammonia nitrogen removal.

A method is disclosed for removing the ammonia nitrogen by conversion of the ammonia nitrogen to the inert nitrogen in a closed system, recycling the treating liquid, to prevent secondary pollution and by successive treatment, such as adsorption, elution electrolysis, adjustment of pH, and cleansing, of the drainage containing the ammonia nitrogen to improve removing ability. The ammonia nitrogen in effluent from waste water treatment plants is adsorbed in an ion-exchange substance such as zeolite and is eluted by treating the ion-exchange substance with a treating liquid containing mainly alkali metal chlorides to regenerate it. The treating liquid containing the ammonia nitrogen is electrolyzed to produce active chlorine which decomposes oxidatively. The gas generated by the decomposition is brought into contact with an adjusting liquid, containing a hydroxide of the same alkali metal as that used in the treating liquid. The adjusting liquid which has adsorbed the acid gas is added to the electrolyzed treating liquid to adjust hydrogen ion concentration, to supplement the alkali metal ion and decompose the remaining ammonia nitrogen by the recovered active chlorine. Finally the treating liquid is recirculated, after cleansing by passing through active carbon to decompose residual chlorine to the initial ion-exchange process. (Sinha - OEIS)
W76-06463

SUBMERGED MULTIPORT DIFFUSERS FOR COOLING WATER DISCHARGE,
Massachusetts Inst. of Tech., Cambridge, Mass. (Assignee).
G. H. Jirka, and D. R. F. Harleman.

U.S. Patent No. 3,934,599, 4 p, 13 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1712, January 27, 1976.

Descriptors: *Patents, *Cooling water, *Thermal pollution, *Water pollution sources, *Waste water treatment, Electric powerplants, Diffusion Dispersion, Mixing, Temperature.
Identifiers: Multiport diffusers.

Submerged multiport thermal diffusers are devices for the discharge into ambient water bodies of large quantities of heated cooling water primarily from electric power generation. The need for such devices stems largely from environmental considerations, which require considerable mixing of the heated water, and hence temperature reduction, in order to limit ecological damages. For typical conditions the amount of required mixing, i.e., the dilution, varies between five and twenty. Furthermore, this mixing has to be obtained within relatively small areas, depending on the locality. The multiport diffuser has a main pipe for submerged disposition at or near the bottom of a large body of water. It has a large number of nozzles oriented at predetermined variable angles to the axis of the pipe, the angle of orientation being a function of the axial location of the particular nozzle and the half-length of the main pipe. (Sinha - OEIS)
W76-06464

AUTOMATIC WATER DISTILLER,
For primary bibliographic entry see Field 5F.
W76-06469

PROCESS FOR THE TREATMENT OF WASTE WATERS CONTAINING SULFURIC ACID AND/OR AMMONIUM SULFATE,
Institut Francais du Petrole, Paris. (Assignee).
J. Alagy, C. Busson, and M. Cessou.
U.S. Patent No. 3,935,100, 7 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1873, January 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Chemical wastes, *Industrial wastes, Water pollution treatment, Water pollution control, Water quality control, Chemical reactions, Separation techniques, Sulfates, Sulfides, Sulfur.
Identifiers: *Sulfuric acid, *Ammonium sulfate, Barium sulfide.

A process for treating a waste water containing sulfuric acid and/or ammonium sulfate comprises the steps of: reacting the waste water with barium sulfide, introduced at least partly in the solid state, so as to form a suspension of solid barium sulfate in waste water; reacting the resulting barium sulfate at high temperature with carbon (containing inorganic impurities) so as to form solid barium sulfide (containing inorganic impurities) and a gas which is separated; recycling to the first step at least the major portion of the formed solid barium sulfide; and dissolving in water a minor portion of solid barium sulfide from the second step, separating the resulting solution from the insoluble impurities. At least one portion of the resulting purified solution of barium sulfide is transferred to the first step. In this method sulfur can be recovered and recycled. (Sinha - OEIS)
W76-06470

CLARIFICATION PROCESS,
Georgia-Pacific Corp., Portland,Oreg. (Assignee).
For primary bibliographic entry see Field 5F.
W76-06471

GEOTHERMAL POWER SYSTEM AND METHOD,
For primary bibliographic entry see Field 3E.
W76-06472

APPARATUS FOR SEPARATING LOW-DENSITY LIQUID FROM A RELATIVELY MORE DENSE LIQUID SUBSTANTIALLY IMMISCIBLE THEREWITH,
Erdol-Raffinerie Neustadt G.m.b.H. and Co. (West Germany); and King-Wilkinson, Inc., Tulsa, Okla. (Assignee).
For primary bibliographic entry see Field 5G.
W76-06473

AUTOMATIC FOAM REMOVER FOR FLOTATION TANKS,
Waste Water System, Inc., Hoffman Estates, Ill. (Assignee).
C. E. Russell, F. E. Russell, and M. B. Pearson.
U.S. Patent No. 3,935,104, 4 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1874, January 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water pollution control, Water quality control, Industrial wastes, *Foam separation, Flotation, Separation techniques.
Identifiers: Vacuums.

An automatic foam removing apparatus is described for use in an industrial flotation system for the separation of suspended solids and immiscible liquids from a body of water. In a rectangular flotation tank gas bubbles are formed which rise through the waste water body carrying insoluble and immiscible matter with them to the surface to form a layer of froth, foam or sludge. The surface is maintained at a constant level by overflows. The foam remover comprises a hollow beam extending horizontally across the top portion of the tank and having its bottom edge at a distance above the waste water level with a downward open slot extending along the bottom edge. An elongate flat-faced vane is mounted within the hollow beam for pivotal movement on a horizontal axis above the slot and extending downward through the slot to a level below the surface. A conduit provides communication between a vacuum source and the interior of the hollow beam. The beam moves back and forth by means of a motor driven endless chain. Movement of the beam in one direction tends to cause compression of the foam in front and causes the vane to pivot into engagement with the rear edge of the slot and thus subjects the foam to the suction action and discharge of the foam through the conduit. The operation is repeated during the reverse movement of the beam with the vane in engagement with the other edge of the slot. (Sinha-OEIS)
W76-06474

TUBULAR FILTER IN SETTLER,
Henry Mfg. Co., Inc., Bowling Green, Ohio. (Assignee).
S. N. McEwen.
U.S. Patent No. 3,935,105, 6 p, 11 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1875, January 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Water pollution control, Water quality control, *Filtration, *Filters, Settling basins, Suspended particles, Separation techniques.
Identifiers: Filter cake.

A separator for solid particles from a liquid, such as a dirty industrial machine tool coolant, comprises a settling tank with one or more frames or assemblies of horizontally extending tubular filters. Such frames are removably clamped against the side of the settling tank over suction outlets. Each of the filter frames has a chamber into which all of the tubular filters connect. Socks are provided for the tubular filters and may contain seams that are aligned in vertical planes for the easy severance of the cakes of solid particles which build up upon them. A bottom drag out conveyor may be provided for the settling tank and a suction pump draws the liquid through the filters into an adjacent clean tank. When the coating of removed solid particles on the tubular filters becomes excessive a predetermined vacuum occurs on the intake of the pump, the suction may be automatically shut down, and reverse pressure applied to the filters to bump off the cake that has formed on the filters so it can settle and be removed from the settling tank. If required a precoat filter medium may be applied to the filters. (Sinha - OEIS)
W76-06475

STRAINING APPARATUS,
AB Celleco, Tumba (Sweden). (Assignee).
For primary bibliographic entry see Field 3E.
W76-06476

PROCESS FOR DEWATERING A PROTEINACEOUS, AQUEOUS SLUDGE AND FOR REMOVING AND RECOVERING PRECIPITATING AGENTS FROM A PRECIPITATE CONTAINING PROTEINACEOUS SUBSTANCES,
Apothekernes Laboratorium for Specialpraeparator A/S, Oslo (Norway). (Assignee).
P. Nettli.
U.S. Patent No. 3,936,375, 7 p, 5 fig, 7 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 943, No 1, p 336, February 3, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Proteins, *Sludge treatment, Coagulation, Agglomeration, Chemical reactions, Separation techniques, Heating, *Dewatering, Hydrogen ion concentration, *Chemical precipitation.
Identifiers: Precipitating agents.

The object of the invention is to condition proteinaceous sludges by addition of a suitable coagulating agent, so that heating of the sludge being conditioned in this manner yields a rapid and satisfactory coagulation and agglomeration of proteinaceous organic material, and the coagulated material can be removed by sedimentation, preferably in a centrifuge. The process provides a method for treating a proteinaceous sludge and comprises a chemical-thermal combination method yielding a concentrated proteinaceous sludge with a high content of solids simultaneously with the utilized precipitating agent going into solution in the separated aqueous phase and thus renders it possible to recover the precipitating agents. The conditioned sludge is mixed with calcium chloride, and treated with a base selected from the group consisting of alkali metal hydroxides and alkaline earth metal hydroxides to adjust the pH to a value in the range of 6.5-9.5. The mixture is then heated to a temperature in the range of 60 deg - 120 deg C. to coagulate and agglomerate the sludge, which is then separated from the aqueous phase containing the precipitating agent. (Sinha - OEIS)
W76-06478

SEWAGE TREATMENT APPARATUS,
J. Pacaud.
U.S. Patent No. 3,936,381, 4 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 943, No 1, p 338, February 3, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Domestic wastes, Water pollution treatment, Water pollution control, Water quality control, *Aeration, Turbulence, Water purification, Odor, Activated sludge, Application equipment.

The apparatus for the treatment of domestic sewage water is comprised of an outer tank and an inner tank which is placed within the outer tank to form a space between the vertical walls. The bottom of the inner tank is formed in such a way that light particles are prevented from ascending into the clarification tank. An aeration system provides a sufficient upwards suction of water for

iomogenizing, aerating and recirculating the ludges. The upper end of the clarification tank an be closed to permit trapping of fines of light articles in suspension which have been formed in he clarification tank. Nozzles slightly above the vater level are provided for the evacuation of the ght particles. A floating member protects the noz- les against the turmoil created by the aeration tur- ine. Treated or purified water is discharged hrough an outlet above the water level every time here is a new arrival of sewage water. (Sinha - OEIS)
W76-06481

VAPORATION APPARATUS OF SPECIAL IATERIAL,
ooker Chemicals and Plastics Corp., Niagara alls, N.Y. (Assignee).
E. Houston.
.S. Patent No. 3,937,646, 6 p, 1 fig, 11 ref; Offi- al Gazette of the United States Patent Office, ol 943, No. 2, p 812, February 10, 1976.

escriptors: *Patents, *Water purification, Alkali metals, *Industrial wastes, *Water quality ntrol, Water pollution control, Water pollution eatment, *Evaporation, Heating, Separation chniques, *Evaporators, Heat exchangers.
entifiers: Alkali metal hydroxides, Alkali metal lorides, Ferritic stainless steel.

he invention provides an evaporation apparatus r use in the evaporation, concentration and pu- ication of aqueous solutions containing alkali etal hydroxides and alkali metal chlorides, both th and without alkali metal chlorates. The ap- ratus has a liquid receiving chamber for the aterial to be processed, a flow through heating ne containing heat transfer elements, a separa- n chamber for forming a liquid-vapor mixture, ssageways connecting the chambers and zones d baffle and distribution means positioned with e chambers, zones and passageways. Those sur- es of the chambers, zones, passageways, baffle d distribution means of the apparatus which are contact with the solution of alkali metal hydrox- -alkali metal chloride material at temperatures excess of about 50 deg C consist of a ferritic inless steel. By the use of this material of con- uction, there is obtained an evaporation ap- ratus which may be successfully operated over a ad range of operating conditions and over ex- ded periods of time without the necessity for ng shut down for replacement of component ts due to corrosion and/or stress cracking, but ich cost appreciably less than comparable ap- ratus fabricated from nickel. (Sinha - OEIS)
6-06482

RINE DISCHARGE CONTROL APPARATUS D METHOD FOR TREATING FLUIDS ON A RINE VESSEL,
ne Corp., New York. (Assignee).
primary bibliographic entry see Field 5G.
6-06483

BRASKA NPDES PERMIT REGULATIONS.
primary bibliographic entry see Field 5G.
6-06495

VADA WATER POLLUTION CONTROL WS.
primary bibliographic entry see Field 5G.
6-06496

EGON WATER QUALITY CONTROL REGU- IONS.
gon Dept. of Environmental Quality, Salem.
primary bibliographic entry see Field 5G.
-06497

WISCONSIN WATER POLLUTION CONTROL LAWS.
For primary bibliographic entry see Field 5G.
W76-06498

WISCONSIN DISCHARGE PERMITS REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-06499

OREGON SYNTHETIC CLEANSING AGENT ACT,
For primary bibliographic entry see Field 6E.
W76-06502

WASHINGTON WATER POLLUTION CONTROL LAWS,
For primary bibliographic entry see Field 5G.
W76-06504

WASHINGTON WASTE WORKS REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-06507

WASHINGTON WATER POLLUTION CONTROL PLANNING REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-06508

WASHINGTON NPDES PERMIT PROGRAM REGULATIONS,
For primary bibliographic entry see Field 5G.
W76-06510

SOAP AND DETERGENT MANUFACTURING CATEGORY (PRETREATMENT STANDARDS FOR INCOMPATIBLE POLLUTANTS).
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06517

EFFLUENT LIMITATIONS AND GUIDELINES - PRINTING INK FORMULATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06520

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06521

PRELIMINARY ENGINEERING ANALYSIS, YUMA DESALTING PLANT.
Burns and Roe, Inc., Paramus, N. J.
For primary bibliographic entry see Field 3A.
W76-06547

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING 'AS LOW AS PRACTICABLE' GUIDES--APPENDIX A. PREPARATION OF COST ESTIMATES FOR VOLUME 1, MILLING OF URANIUM ORES,
Oak Ridge National Lab., Tenn.
A. D. Ryon, and R. E. Blanco.
Report No. ORNL TM-4903, Vol. 2, May 1975. 259 p. W-7405-eng-26.

Descriptors: *Waste treatment, *Industrial wastes, *Radioactive wastes, *Costs, Estimated costs, Dusts, Effluents, Solid wastes, Wyoming, New Mexico, Landfills, Operating costs, Capital costs, Facilities, Underground storage, Nuclear wastes.
Identifiers: *Uranium ore mills.

The methods used to estimate the capital and operating costs of alternate installations required for treating radioactive wastes at model uranium mills at Wyoming and New Mexico are detailed. Chemical and equipment requirements are based on model acid-leach solvent-extraction and for alkaline leach mills processing 2000 tons ore per day. Capital costs, in mid-1973 dollars, for treatment of solid and liquid mill effluents by the acid metho range from $284,000 to $20,257,000; perating costs range from $61,000 to $4,809,000. Capital costs for the alkaline method range from $279,000 to $7,538,000 and operating costs vary from $61,000 to $6,302,000. Seven alternate treatment procedures for airborne emissions are described and represent $88,000 to $3,942,000 capital costs and $10,800 to $67,600 in operating costs. The annual fixed charge is 24% of the capital cost and the contribution to power cost is based on the total uranium oxide requirements of a power reactor over its life. The capital costs cover installation, piping, instruments, utilities, design, engineering, and construction, and a 40% allowance for interest during construction and for contingencies. The operating costs were computed by estimating labor, supplies, and maintenance requirements for the waste treatment processes applicable to the uranium milling industry and include a 15% allowance for contingency expenses. (Auen-Wisconsin).
W76-06614

REFINERY EFFLUENT WATER TREATMENT PLANT USING ACTIVATED CARBON,
Atlantic Richfield Co., Carson, Calif.
G. C. Loop.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 389, $5.50 in paper copy, $2.25 in microfiche. Report EPA-660/2-75-020, June 1975. 92 p, 30 fig, 10 tab. EPA 1BB036 12050 GTR.

Descriptors: *Activated carbon, Adsorption, Organic loading, Oxygen demand, Pollution abatement, Settling basins, *Waste water treatment, Carbon regeneration, *Chemical oxygen demand, Treatment facilities.
Identifiers: Intermittent carbon treatment plant, Calgon process.

Reduction of Chemical Oxygen Demand (COD) in petroleum refinery effluent wastewater by adsorption onto activated carbon was demonstrated on a commercial level during a two-year project at Carson, California. The plant contained over 750,000 pounds of carbon, regenerated 1,644,000 pounds of carbon, processed 172 million gallons of water, and removed 408,000 pounds of COD. The carbon was exhausted at the rate of 9.5 pounds per 1000 gallons of water processed. At an average feed COD concentration of 250 ppm and an average effluent COD concentration of 50 ppm, the carbon was loaded to an average of 0.26 pounds of COD per pound of carbon. Following solution of initial startup problems, the unit was operated at a cost of 40 cents per 1000 gallons of water treated, or 18 cents per pound of COD removed. (EPA)
W76-06646

AUTOMATIC ORGANIC MONITORING SYSTEM FOR STORM AND COMBINED SEWERS,
Raytheon Co., Portsmouth, R.I.
For primary bibliographic entry see Field 5A.
W76-06651

INFRARED DRY CAUSTIC VS. WET CAUSTIC PEELING OF WHITE POTATOES,
Western Potato Service, Inc., Grand Forks, N. Dak.
O. Sproul, J. Vennes, W. Knudson, and J. W. Cyr.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 408, $4.50 in paper copy, $2.25 in microfiche. Report EPA-660/2-74-088. June 1975. 64 p, 12 fig, 26 tab, 11 ref. 12060 EIG. EPA 1BB037.

Descriptors: Environmental engineering, *Food processing industry, Potatoes, *Industrial wastes, *Waste treatment, *Waste water treatment.
Identifiers: *Potato processing wastes, *Infrared dry caustic system, *Wet caustic system.

The infrared dry caustic peeling system has been evaluated through plant scale comparisons with the conventional wet caustic system. The following significant differences were noted when the dry peel system was compared to the wet process: (a) decreased peel loss by 13.1 percent. (b) decreased caustic consumption by 26 percent. (c) decreased wastewater from peeling by 73 percent. (d) decreased BOD5 in the peeler wastewater by 78 percent. (e) decreased suspended solids in the peeler wastewater by 77 percent. (f) decreased alkalinity in the peeler wastewater by 61 percent. (g) increased operating costs of peeling by 39 percent but decreased total annual cost of peeling and primary treatment through lower peel loss by 10 percent. (h) decreased total plant raw waste load: water use by 18 percent, BOD5 by 47 percent, and suspended solids by 57 percent. No significant differences were noted in the efficiency of primary sedimentation of the raw wastes nor in the mud clarifier results. Primary sludges and their dewatering characteristics were similar. (EPA)
W76-06652

WATER POLLUTION ABATEMENT THROUGH FOREST IRRIGATION WITH MUNICIPAL WASTE WATER,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
W. E. Sopper.
In: Groundwater Pollution - Symposium (Proceedings of the Moscow Symposium) August 1971. 17 p, 10 tab, 11 ref. IAHS-AISH Publication No. 103, 1975. OWRT B-001-PA(9), B-047-PA(5). 14-31-0001-3639. 14-01-0001-837.

Descriptors: *Waste water treatment, *Waste water disposal, Pollution abatement, Surface waters, Recharge groundwater, Groundwater reservoirs, Environmental sanitation, Disposal, Abatement, Crop production.
Identifiers: *Forest irrigation, *Municipal wastewater, *Land disposal, Wood fibre increase.

Serious pollution problems are often created by the disposal of municipal waste water into surface waters. An obvious alternative method is diversion of these waste waters to the land. Such non-aqueous methods of disposal might eliminate or alleviate many water pollution problems and, in some cases, could even provide secondary benefits such as recharge of groundwater reservoirs, and increased production of crops and wood fibre. Research results during the past 8 years from the Pennsylvania State University Waste Water Renovation and Conservation project indicate that large volumes of municipal waste water can be successfully disposed of through irrigation of forest land. With properly programmed application rates, waste water can be satisfactorily renovated and considerable amounts of high-quality water recharged to the groundwater reservoir. In addition, secondary benefits such as increased tree growth, increased site productivity, and site amelioration have also been obtained. The deliberate reclamation of waste water for potential reuse is one of the keys to optimum utilization of water resources. (Sink-Penn State)
W76-06668

URBAN EFFECTS ON THE DISTRIBUTION OF HEAVY CONVECTIVE RAINFALL,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4C.
W76-06680

YBBARPSAN-A SMALL RECEPTACLE FOR A LARGE INDUSTRY: WATER CONSERVATION ACTION IN THE VICINITY OF PERSTORP AB, (IN SWEDISH),
I. Borgstrom, and G. Grankvist.
Vatten 29(4), p 418-428, 1973.

Descriptors: Water conservation, Europe, *Activated sludge, *Waste water treatment, *Treatment facilities, Biochemical oxygen demand, Organic wastes, Water reuse, Industrial wastes.
Identifiers: Ybbarpsan.

The steps taken by Perstorp AB, a chemical and plastics manufacturing firm in Sweden, to eliminate pollution from its wastewater are discussed. A wastewater treatment plant based on activated sludge process was constructed. The plant is constructed for an addition of 3000 kg BOD7 (biological oxygen demand) a day. The wastewater to be treated contains mainly aldehydes, alcohols, organic acids and their salts. The efficiency of BOD7-reduction is about 90%. Experiences for 2 yr of plant operation are presented.--Copyright 1975, Biological Abstracts, Inc.
W76-06732

TREATMENT PLANTS FOR REMOVING HELMINTHS FROM SEWAGE BEFORE ITS USE ON CULTIVATED PASTURES, (IN RUSSIAN),
All-Union Scientific Research Inst. of Medical Parasitology and Tropical Diseases, Moscow (USSR).
N. A. Romanendo, F. S. Marenkin, Z. M. Smirnova, and L. F. Rakhvalova.
Gig Sanit 11, p 80-81, 1974.

Descriptors: *Waste water treatment, Waste disposal, *Sewage treatment.
Identifiers: *Helminths eggs removal.

In the treatment method developed, the sewage is first held for 2 h in settling tanks, then it passes to filtration fields, and then to a storage pond where it is held for at least 20-30 days. After this the sewage is collected for irrigation of cultivated pastures. This method provided complete and reliable removal of helminth eggs from sewage.--Copyright 1975, Biological Abstracts, Inc.
W76-06795

5E. Ultimate Disposal Of Wastes

MARINE POLLUTION CONTROL: PART III--SHIP DESIGN REQUIREMENTS: THE DESIGN APPROACH,
Naval Ship Engineering Center, Hyattsville, Md. Environmental Pollution Control Branch.
For primary bibliographic entry see Field 5D.
W76-06196

UTILIZATION OF ANIMAL MANURES AND SEWAGE SLUDGES IN FOOD AND FIBER PRODUCTION,
Iowa State Univ. of Science and Technology, Ames. Council for Agricultural Science.
For primary bibliographic entry see Field 5D.
W76-06198

PHILADELPHIA'S SOLID WASTES STRATEGY STRESSES PRIVATE SECTOR PARTICIPATION,
Philadelphia Dept. of Streets, Pa.
D. J. Damiano.
Refuse Removal Journal, Solid Wastes Management, Oct. 1975, Vol 18, No. 10, p 40, 50-52, 53.

Descriptors: *Management, *Solid wastes, *Waste disposal, *Municipal wastes, *Pennsylvania, Land reclamation, Long-term planning, Econimics, Railroads, Strip mines, Financing, Energy conversion, Incineration, Recycling.
Identifiers: *Philadelphia(Pa), Demonstration projects.

The strategy adopted by Philadelphia for handling urban solid wastes is described. Alternatives to local and New Jersey landfills were needed, thus a plan was conceived to rail haul solid wastes for reclamation of abandoned strip mines. After examining alternatives, use of private business, rather than government, appeared advisable. Bidders' qualifications were the ability to remove up to 1000 tons waste/day to remote disposal sites subject to rigid ancillary requirements. A public/private financing system was devised. An energy recovery feasibility study recommended a new 1600 ton/day thermal conversion facility, upgrading of continuous-feed incinerators, and conversion of four batch-fed incinerators to transfer stations. With other components of the city's disposal system, 15,000 tons refuse/week could be handled. The plan is being evaluated and financing is being studid. Another study is being conducted on the marketability of energy and materials recovered from municipal refuse. After examining various alternatives, Philadelphia is using the legal, financial, and managerial capabilities of the private sector. The emergence of private stockholder-owned companies in the municipal refuse field is a new development and a segment of innovative, long-range planning. (Buchanan Davidson--Wisconsin)
W76-06199

TWO MILLION YARDS OF BURIED REFUSE MOVED.
Refuse Removal Journal, Solid Wastes Management, p. 10-12, October 1975.

Descriptors: *Relocation, *Landfills, Sites, *New York, Compaction, Estimated costs, Barges, Excavation, Transportation, Pollution abatement, Odor.
Identifiers: *Landfill relocation, Buffalo(NY), Odor control.

In 1973 the Sewer Authority of Buffalo, New York, decided to build a secondary wastewater treatment plant on a 20-year-old landfill site containing over 2 million cubic yards of compacted refuse. It was decided to move the material by barge to a site miles away. Estimated costs were about $10,250,000. An impervious barrier was built around the perimeter and a leachate collection system installed to prevent waste liquid escape to the new site. Refuse excavation was done with specially equipped dozers. A clamshell crane lifted out large items which might clog the conveyor. The refuse was carried by conveyor to the river where barges transferred about 20,000 tons a day. Care was taken to avoid spillage where the conveyor crossed a service road. The main environmental problem was odor. When crossing the service road, refuse was wetted down with Odab odor modifier in the winter; in the summer, Chemscreen odor modification system formed an odorabating vapor. Tarpaulins covered barges and dump trucks were used to carry refuse to the new site to prevent blowing trash. Refuse was spread, compacted, covered with soil, and seeded with fescue and bluegrass, thus creating a new park. (Buchanan-Davidson--Wisconsin)
W76-06223

EFFICIENT IN-HOUSE HANDLING OF SOLID WASTE,
R. A. Young.
Pollution Engineering, Vol. 7, No. 1, p. 43-1975. 1 fig.

Descriptors: *Solid wastes, *Waste disposal, Incineration, Automation, Equipment, Costs, Economic efficiency, Waste treatment.
Identifiers: In-house waste collection, Commercial wastes, Warehouses, Hospitals, Conveyor systems.

Refuse collection and transport to disposal areas usually accounts for more than 75% of solid waste management costs. Handling wastes by automated methods can improve efficiency of refuse disposal and reduce costs. Bamberger's Distribution Center, Raritan Center, New Jersey, generates an estimated 18,000 cubic yards of waste per year in their warehouse. It uses a towcart system to move supplies and remove solid wastes to an incinerator. Trash carts are located where refuse is generated. Bamberger's Department Store, Langhorne, Pennsylvania, creates about 600 cubic yards uncompacted waste monthly. A storewide conveyor system leads to an automatic shredder and compactor which continuously supplies waste to an incinerator through a drop chute. Cost was about 100,000. Alachua Hospital, Gainesville, Florida, has a dual pneumatic tube system. The same air stream moves trash to the incinerator or laundry to the laundry room. Trash accumulates in a hopper until the desired weight, then is emptied by an attendant into an incinerator; this last operation is being automated. The type and amount of solid waste will determine what type of mechanized equipment is required and if savings are possible over manual methods. (Buchanan-Davidson--Wisconsin)
W76-06224

DEVELOPER'S PLANS DETAIL TRASH COLLECTION SYSTEM.
Refuse Removal Journal, Solid Wastes Management, Vol. 18, No. 1, p. 20, 22, 58, 1975.

Descriptors: *Municipal wastes, *Sanitary engineering, *Solid wastes, *New Jersey, Costs, Contracts, Compaction, Equipment, Recycling.
Identifiers: *Waste collection, Shopping centers, East Brunswick(NJ), New Brunswick(NJ), South Amboy(NJ), Paper recycling(NJ), Commercial wastes.

The trash collection system at the Brunswick Square Mall, East Brunswick, New Jersey, is the Bobbey Refuse Handling System. All, except two stores which have their own waste pickup contracts, compact their waste in individual compactors. Waste from each store is metered. Stores must comply with strict standards for handling waste. Compacted material is removed to a nearby landfill site by Jersey Sanitation, Inc. This firm also handles residential collections for New Brunswick, East Brunswick, and South Amboy. The contracts require pick up of all residential trash at a fixed overall fee, thus imposing economic efficiency. Because some alleys are small, pickup trucks haul trash to the street, where it is transferred to rear loading trucks. About 10,000 people are served with a pickup truck and a two-man crew. Private two-way radios link trucks and foremen who oversee the residential pickups. The areas served are small and close to landfill sites. The company is also experimenting with paper recycling. Garden apartment complexes are being encouraged to segregate paper and shopping malls are encouraged to keep corrugated materials out of the compactor. (Buchanan-Davidson--Wisconsin)
W76-06225

CONVERSION OF DESALINATION PLANT WASTES TO SOLIDS,
Geiger (W. L.) Associates, Inc., Ann Arbor, Mich.
For primary bibliographic entry see Field 3A.
W76-06248

USING WASTEWATER SOLIDS TO RECLAIM STRIP-MINED LAND,
Metropolitan Sanitary District of Greater Chicago,
For primary bibliographic entry see Field 5G.
W76-06287

CAERNARFON SLUDGE GOES UP IN SMOKE,
M. C. Bailey, and J. G. Palmer.
Surveyor, Vol. 146, No. 4355, p 18-21, November, 1975. 2 fig.

Descriptors: *Incineration, *Sludge treatment, *Dewatering, *Sludge disposal, Centrifugation, Odor, Sulfur, Sewage treatment, Treatment facilities, Design.
Identifiers: Fluidized bed reactor.

A fluidized bed reactor was chosen for the new incineration plant being installed in the tourist town of Caernarfon, United Kingdom. Incineration was chosen over other sludge disposal methods because it takes place at the treatment plant site and it is odorless. Disposal of sludge as fertilizer was not suited to the grazing land around the town, and drying the sludge in open beds is not practical due to the average 60 inches of rainfall each year. The Caernarfon sludge will not be dry enough to be autothermic, so supplementary fuel oil will be necessary. To remove the sulfur from the gas emissions produced not only by the sludge waste but also by the fuel oil, a dry gas cleansing system with limestone or dolomite will be annexed to the incinerator. Particulate matter and heat will be recovered in a heat exchanger. Since the incinerator requires preliminary dewatering of the sludge, centrifuging was selected as the most economical and the simplest dewatering method. A feature of the centrifuge is the 100% standby capacity that insures that the incinerator will never be out of action if the dewatering plant fails. The total sewage treatment works were designed to cope with flows from a population of 12,500 but can be expanded to handle flows from a population twice that size. The treatment plant construction is completed and the incinerator is scheduled to be completed by March, 1976. (Loustau-FIRL)
W76-06291

SLUDGE DISPOSAL ALTERNATIVES,
Camp, Dresser and McKee, Inc., Boston, Mass.
A. A. Kalinski, A. B. Pincince, M. H. Klegerman, and T. F. X. Flynn.
Water and Sewage Works, Vol. 122, No. 11, p 61, November, 1975.

Descriptors: *Incineration, *Burning, *Sludge disposal, *Costs, Fertilizer, Energy, Sludge treatment.
Identifiers: *Pyrolysis.

Incineration or pyrolysis was found to be the most cost-effective, technically feasible, and environmentally acceptable method for disposing sludge, according to the results of a study funded by the EPA for the New York-New Jersey area. The study took into consideration that the present sludge production of 600 tons/day may expand to 2000 tons/day by the year 2000. It was assumed, based on present values, that the volatile solid content would be about 50% of the total, and the fuel value of the total solids would be approximately 5,000 Btu/lb. An average value of 4% solids was assumed. The choice of incineration as the best method was made in comparison with disposal of either liquid digested sludge or dewatered sludge cake on a strip mine area 100 miles from the study area. In this comparison, the total cost of disposal was over double the net cost for incineration or pyrolysis. The possibility of producing a commercial fertilizer from the sludge was not even comparable to incineration due to the high expense of fertilizer production. The incineration process includes sludge conditioning with chemicals and use of filter pressing to obtain a 40% solids sludge cake. During normal operation, the system for incineration or pyrolysis will consume no auxiliary fuel, except if afterburning is required, and the energy recovery will supply all electrical requirements of the sludge processing facility. Moreover, there will be a significant amount available for other uses. (Loustau-FIRL)
W76-06292

HORIZONTAL SPREAD OF WASTEWATER FIELD OVER CALM OCEAN SURFACE,
Montgomery (James M.), Pasadena, Calif.
For primary bibliographic entry see Field 5B.
W76-06294

EVIDENCE FOR NEW ALUMINUM PHOSPHATE PHASE FROM REACTION RATE OF PHOSPHATE WITH ALUMINUM HYDROXIDE,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soils and Fertilizers.
W. H. Van Riemsdijk, F. A. Weststrate, and G. H. Bolt.
Nature, Vol. 257, No. 5527, p 473-474, October 9, 1975. 2 fig, 1 tab, 8 ref.

Descriptors: *Phosphates, *Nutrient removal, Kinetics, Waste water disposal, Aluminum, Chemical precipitation, Soils, Sewage disposal, Pollutant identification, Analytical techniques.
Identifiers: Aluminum phosphate, Sterrettite.

In systems where waste water is disposed directly onto the soil, the reaction between phosphate and aluminum hydroxide is an important one. It has been suggested that the precipitation of phosphate occurs when raw sewage water is applied to sandy topsoil for an extended period of time. The presence of an aluminum phosphate has been indicated as the main fraction of phosphate retained. Experiments on this precipitation reaction were performed at 20.5 + or minus 0.1 C with an initial phosphate concentration of 0.36 mmol/cu dm at a pH of 5. Results of the measurements are presented in a semi log plot of the measured phosphate concentration as a function of reaction time for a suspension concentration of 0.2 g/cu dm A1(OH)3. An increase in reaction rate on the graph was hypothesized to be due to the initiation of the growth of a crystalline aluminum phosphate. This supposition was tested using electron microscopy, electron diffraction, and X-ray diffraction. From the results, crystalline structures with a measured value agreeing with those of sterrettite were found. Evidence indicated that the growth of an aluminum phosphate phase was the rate determining step after a particular point on the graph. (Kramer-FIRL)
W76-06295

SIGNIFICANCE OF TRACE METALS AND NITRATES IN SLUDGE SOILS,
Environmental Protection Agency, Columbus, Ohio. Div. of Waste Management and Engineering.
R. E. Brown.
Journal Water Pollution Control Federation, Vol. 47, No. 12, p 2863-2875, December, 1975. 3 fig, 7 tab, 39 ref.

Descriptors: *Trace elements, *Soil analysis, *Heavy metals, *Zinc, Toxicity, Sludge disposal, Fertilization, Metals, Nitrates, Environmental effects.
Identifiers: Land application.

There is substantial potential for damage to the productivity of soils that are fertilized with waste water sludge, if no restrictions are made on the metal and nitrogen accumulations in the soil. A comparison of sludge-amended soils and soils that received no sludge showed that extractable zinc increased many times in sludge-amended soils. In addition, almost all of the applied zinc remained in an extractable form, thus presumably more available for plant uptake than metals in soils that have not received sludge. One report attributed crop damage in 24 cases to application of sludge. Another report showed that sludge applications that increased zinc by approximately 340 lb/acre

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produced no metal toxicity in corn grown on the site. Although data are not available to evaluate long-term effects of metals in sludge, it is generally agreed that, on a short-term basis, the addition of metal salts to soils without sludge would be more likely to cause metal toxicity conditions in plants than would an equivalent amount of metal from waste water sludge. Concerning nitrate pollution, there is no question of the fact that nitrate content of drainage waters from a sludge disposal site would be excessively high if no restrictions were placed on application. Dilution of the drainage water by groundwater or receiving water could minimize the hazard. In the case of sludge application to crop soils, the nitrogen application must equal the sum of gaseous nitrogen losses and the nitrogen requirement of the crop. Any excess would become a hazard in leachate groundwater. Because of the many variables, amounts of nitrogenous sludge applicable to soils should be determined on a site-by-site basis. (Loustau-FIRL)
W76-06307

HYDROLOGICAL AND HYDROGEOLOGICAL ASSESSMENT OF LANDFILL SITES,
R. Aspinwall.
Solid Wastes, Vol. 65, No. 8, p 390-403, August, 1975.

Descriptors: *Solid wastes, *Landfill, *Waste disposal, Rainfall, Drainage, Public health, Soil chemical properties, Soil physical properties, Aquifers, Environmental effects, Aquifers.

The variables of a solid waste disposal pit are the amount of rainfall, the overall catchment area of the pit, the actual top of the excavation, the volume of waste going into the pit, and the catchment area which must be controlled by artificial drainage works. If a pit is lined with impervious clay, the leachates will not seep away and the pit will fill up with water not only from rainfall but also from liquid wastes that have no other disposal system available. In England it was estimated that there are some 500 million gallons of liquid waste produced annually that are unacceptable for incineration or mineshaft disposal and are probably being dumped anywhere space can be found. For pit disposal in the present clay lined type, a conservative estimate of 30-acre pits needed for waste disposal would be 12 new pits a year. In addition, this solution of waste disposal produces water pollution and health hazards. A new model of landfill site has been proposed: a permeable earth medium on top of a permanent saturation. The chemical properties of the earth, especially with some clay present, would remove heavy metals and degrade the leachate. At the saturate zone the leachate would be diluted with existing groundwater and travel a long distance to a safe discharge point in the sea or a river. Such a site would be considered an aquifer and an important national asset as a water storage and collection site. Local water authorities might object to the idea, but the need for safe waste disposal must be weighed against the loss of some aquifers. (Loustau-FIRL)
W76-06315

STAGONOSPORA FOLICOLA, A PATHOGEN OF REED CANARYGRASS SPRAY-IRRIGATED WITH MUNICIPAL SEWAGE EFFLUENT,
Agricultural Research Service, University Park, Pa. Regional Pasture Research Lab.
K. E. Zeiders.
Plant Disease Reporter, Vol. 59, No. 10, p 779-783, October, 1975. 1 fig, 1 tab, 10 ref.

Descriptors: *Sewage effluents, *Irrigation, *Waste disposal, Waste water(Pollution), Water pollution effects, Fungi, Plant pathology.
Identifiers: Leaf disease, Reed canarygrass, Stagonospora foliicola.

A field of reed canarygrass (Common) which was spray irrigated with municipal sewage effluent was found to have a foliar disease resembling tawny blotch. Adjacent fields of reed canarygrass with no irrigation had no disease. This occurrence prompted an investigation of the etiology of the disease and studies of the pathogen. The causal fngus, taken from infected reed canarygrass, was isolated from diseased tissue and identified as S. foliicola. Two tests were then made to determine conditions favorable for infection and disease development. Potted ramets of Common reed canarygrass from the irrigated field were inoculated by spraying with a conidial/mycelial suspension of S. foliicola until thoroughly wet. In the first test plants were kept in various combinations of chamber, temperature, and exposure periods, and it was found that disease development was better in plants kept 72 hours in a dew chamber. In the second test, time-of-exposure in a dew chamber was varied, and again disease development was better in plants given a 72-hour incubation period. Of eight species inoculated, only one, P. arundinacea, was susceptible to the disease. These studies indicated that the build-up of tawny blotch on reed canarygrass will be favored by two factors: plants remaining uncut throughout the growing season so that more leaves are exposed to inoculum of the fungus for a prolonged period of time, and periods of three days of cool weather and abundant moisture for infection and disease development to be initiated. The effect of the plant nutrients in the effluent water on disease development was not known because there were no areas irrigated with 'pure' water for comparison. (Loustau-FIRL)
W76-06318

A FRAMEWORK FOR EVALUATING INSTITUTIONAL AND SOCIO-ECONOMIC ISSUES OF LAND TREATMENT OF WASTE WATER,
Economic Research Service, Upper Darby, Pa. Natural Resource Economics Div.
For primary bibliographic entry see Field 5G.
W76-06320

EFFECT OF SEWAGE SLUDGE ON SOME SOIL PHYSICAL PROPERTIES,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
E. Epstein.
Journal of Environmental Quality, Vol. 4, No. 1, p 139-142, January/March, 1975. 7 fig, 2 tab, 10 ref.

Descriptors: *Sludge disposal, *Sewage sludge, *Soil physical properties, Soil water, Waste disposal, Hydraulic conductivity.
Identifiers: *Land application.

The effect sewage sludge application to soil has on soil water retention, hydraulic conductivity, and aggregate stability at 15, 25, and 35 C for 175 days, was determined by weight measurement and the presence of pH and carbon. Raw sludge retained twice the amount of water retained by digested sludge. The two digested sludge treatments (high and low pH) retained approximately 10 times more water than the soil control. With higher temperatures, available water decreased with time and reached equilibrium faster, suggesting that the changes in water retention were related to microbial activity. However, the total carbon contents of the soil-sludge mixtures did not change greatly. Although hydraulic conductivity varied among sludge soil samples initially, after 79 days the hydraulic conductivity was essentially the same. The percent stable aggregates for sludge treatments after 175 days were essentially the same, averaging 34%, compared to 17% in untreated soil control. Temperature had little effect on aggregate stability. This information could affect decisions on disposal of municipal wastes. Rather than dumping sludge into landfills or the ocean, or burning sludge in incinerators, sludge could be added to soil, producing greater soil stability, water infiltration, and water movement. (Loustau-FIRL)
W76-06331

USE OF SEWAGE SLUDGE ON AGRICULTURAL LAND AND THE EFFECTS OF METALS ON CROPS,
Agricultural Development and Advisory Service, Wolverhampton (England).
For primary bibliographic entry see Field 5C.
W76-06339

ZERO DISCHARGE TO THE ENVIRONMENT OF DIFFICULT WASTEWATERS,
For primary bibliographic entry see Field 5D.
W76-06341

REVEGETATING BITUMINOUS STRIP-MINE SPOILS WITH MUNICIPAL WASTEWATER, PART II: QUALITY THE LEACHEATE AND SPOIL CHEMICAL CHANGES,
Pennsylvania State Univ., University Park. Dept. of Forest Hydrology.
For primary bibliographic entry see Field 5D.
W76-06343

LAND DISPOSAL OF SEWAGE SLUDGE, VOLUME I (NOVEMBER 1972 - MARCH 1973).
Guelph Univ. (Ontario).
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 16, Environment Canada, Ottawa, Canada, Training and Technology Transfer Division (Water), Environmental Protection Service, 1972. 39 p, 3 fig, 16 tab, 8 ref.

Descriptors: *Waste water disposal, *Sewage disposal, * *Agriculture, Nutrients, Heavy metals, Leaching, Erosion, Soils, Lime, Runoff, Nitrogen, Water quality, Groundwater, Pollutants, Microorganisms, Coliforms, Bacteria, Hydrogen concentration, Groundwater movement, *Sewage sludge.
Identifiers: *Chemically-treated sludge, Nitrogen transformation, Aluminum sulphate, Ferric chloride, Phosphorus removal.

This study was designed as the first part of a three to five year project to determine the rates at which chemically treated sewage sludges may be safely applied to agricultural land. Initial experiments with sludges resulting from sewage treated with lime, aluminum sulphate, and ferric chloride are described. The sludges were applied to three different soils at rates based on the total nitrogen content of each sludge. The following aspects of sludge application to soil were investigated: rate of nitrogen transformation to soluble forms when chemical sludges are incorporated into sand - soil mixtures; bacterial contamination of runoff and groundwater; the macromorphology, micromorphology, and the chemical and physical states of the soil prior to application; the effect of sludges on plant growth; and nutrient and heavy metal uptake by plants. (Environment Canada)
W76-06365

WASTEWATER DISPOSAL BY SUBMERGED MANIFOLDS,
Miljoplan, Hovik (Norway). Water Pollution Section.
For primary bibliographic entry see Field 5B.
W76-06387

LOW DRIFT SPRAY NOZZLE,
Delavan Manufacturing Corp., West Des Moines, Iowa. (Assignee)
For primary bibliographic entry see Field 5G.
W76-06467

USE OF SILVER AND ZINC TO TRACE SEWAGE SLUDGE DISPERSAL IN COASTAL WATERS,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5B.
W76-06655

BUFFALO HARBOR DIKED DISPOSAL SITES: ENGINEERING PROPERTIES AND DRAINAGE CHARACTERISTICS,
State Univ. of New York Coll. at Buffalo.
D. L. Wright, and R. R. Rumer, Jr.
NYSSGP-SS-75-028, December 1975. 12 p, 3 fig, 1 tab, 3 ref, append.

Descriptors: *Harbors, *Sewage disposal, *Dikes, *Drainage, Landfills, Coastal engineering, Engineering structures, Sanitary engineering, New York, Lake Erie.
Identifiers: *Buffalo harbor(NY), *Diked disposal sites, Slag dikes, Fill material, Drainage networks.

The objective was to determine the engineering properties of the placed fill material and the drainage characteristics of diked disposal sites in the Buffalo harbor area. The hydraulic conductivity of the dredged material and the dikes along with the drainage characteristics of the disposal sites constituted the major focus of the hydraulic study. The engineering properties studied were the consolidation characteristics, bearing capacity, and slope stability of the placed fill. Slag dikes were found to be structurally sound and allowed rapid drainage. The fill material is spongy and not able to maintain slopes; it will not support buildings or roads unless piles are driven or extra underpinnings constructed first. The fill material does not drain well. A drainage network on the surface, with shallow channels sloping gently toward the dikes, would improve matters. (NOAA)
W76-06666

SEWAGE SLUDGE AND AMMONIUM CONCENTRATIONS IN THE NEW YORK BIGHT APEX,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W76-06667

WATER POLLUTION ABATEMENT THROUGH FOREST IRRIGATION WITH MUNICIPAL WASTE WATER,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W76-06668

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES, INVESTIGATION REPORT, PHELPS DODGE CORPORATION, MORENCI TAILINGS DAM, MORENCI, ARIZONA, VOLUME 2,
Ahler (W.A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-06669

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES. INVESTIGATION REPORT, KENNECOTT COPPER CORPORATION, MAGNA TAILINGS DAM, MAGNA, UTAH. VOLUME 3,
Ahler (W.A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-06670

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES. RECONNAISSANCE REPORT, VOLUME 5.
Ahler (W. A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-06672

INCINERATION AT SEA OF LIQUID CHLORINATED RESIDUES (IN FRENCH),
Centre d'Etude et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
J. P. Breittmayer, G. Flatau, M. Barelli, F. Laumond, and D. Puel.
Rev Int Oceanogr Med 39/40, p 213-224, 1975.

Descriptors: *Incineration, Organic wastes, Waste disposal, Organic compounds, Liquid wastes, Toxicity, Food chains, Industrial wastes, Ultimate disposal.
Identifiers: *Organochlorinated compounds.

Intensive industrial use of organochlorinated compounds produces large amounts of highly toxic wastes. Open sea burning may be an effective disposal method, avoiding pollution of the marine environment. While the direct toxicity of these products on each level of a trophodynamic marine food chain is very high, direct or induced toxicity of the vapor phase of the combustion along the same marine food chain was not evident.--Copyright 1975, Biological Abstracts, Inc.
W76-06746

5F. Water Treatment and Quality Alteration

ANNUAL DEVELOPMENT OF PLANKTON IN A RIVER WATER INTAKE WEIR AND IN A TREATMENT POND AND ITS REMOVAL IN TREATMENT PLANTS,
Instytut Ksztaltowania Srodowiska, Warsaw (Poland). Zaklad Uzytkowania i Ochrony Wod.
For primary bibliographic entry see Field 5C.
W76-06211

THE USE OF CHITOSAN COLUMNS FOR THE REMOVAL OF MERCURY FROM WATERS,
Ancona Univ. (Italy). Faculty of Medicines and Ancona Univ. (Italy). Chemistry Lab.
For primary bibliographic entry see Field 5A.
W76-06239

MODERNIZING WATER FILTRATION PLANTS,
Riddle Engineering, Inc., Kansas City, Mo.
W. G. Riddle.
Public Works, Vol. 105, No. 6, p. 86-88, 108, June, 1974. 4 fig, 5 ref.

Descriptors: *Filtration, *Water purification, *Water treatment, *Filters, *Coagulation, Flocculation, Water quality control, Turbidity, Polyelectrolytes.
Identifiers: Turbidimeters.

Capacity of a well designed and maintained old water plant may be increased by modifying piping, basins, supporting elements, and upgrading the filter. The traditional 2 gallon per minute per square foot filtration rate can be multiplied several times, but high-rate filters must satisfy certain critical parameters. The modern 4 to 8 gallon per minute filter incorporates some but usually not all of the following: a dual bed involving two or more layers of graduated materials; wash rates of up to one and a half times traditional designs; air wash; strainer type filter bottom; secondary coagulant consisting of floc-strengthening polyelectrolyte; a pilot filter; and photoelectric turbidimeters to monitor raw water. Improved coagulation is necessary for high speed filtering so that today a comparatively violent flash mix, mechanical stirring in the flocculator basin, and improved instrumentation are called fro. The addition of 10 to 30 parts per billion of polyelectrolyte to the settled water above the filter strengthens the floc which allows it to penetrate deeper into the bed, resulting in a greater use of storage capacity. A pilot filter can detect deterioration of coagulation early so that normal conditions can be restored quickly. Similarly a pilot filter effluent turbidimeter permits adjustments to be made in primary coagulant feed rate and start up of the polymer feeder to the settled water at the filter effluent. Turbidimeters are efficient to operate, the only criticism being in calibration in ranges below .3 Jackson turbidity units. Backwash is an essential part of the system to permit trouble-free operation at high speed. (Smith-North Carolina)
W76-06275

PIONEERING IN WATER FILTRATION,
Whitman and Howard, Inc., Boston, Mass.
S. Medlar.
The American City, Vol. 90, No. 6, p 90-93, June 1975. 6 fig.

Descriptors: *Water supply, *Water treatment, *Filtration, *Water quality control, *Treatment facilities, *Activated carbon, Water pollution control, Water pollution treatment, Pesticide removal, *New Hampshire.
Identifiers: Manchester(NH), Double filtration process, Granular activated carbon(GAR), Lake Messabesic(NH), Merrimack River(NH).

Manchester, N.H. (population 88,000) constructed a $5.9 million treatment plant designed around a double filtration process which removes natural impurities and hazardous chemicals. The 40 million gallon a day facility will promote economic and residential expansion. Abandoning the polluted Lake Massabesic, Manchester will use the Merrimack River as its future source of water. The plant, able to treat either lake or river water, operates with a 5-step process: removal of particulate and dissolved impurities, flash mixing, flocculation and sedimentation, and double filtration with sand and deep-bed granular activated carbon (GAC) filters. This process results in elimination or reduction of color, taste, odor, turbidity, pesticides, volatile organics, phenols, herbicides, gasoline, iron, corrosiveness and toxic chemicals. Construction and operation costs are estimated at $1.40 a year per customer. Advantages of double filtration include increase in carbon adsorption and removal of oxidized iron, low particulate loading reducing backwashing to a minimum, tolerance of a softer granular carbon, ability to function under emergency conditions and savings in power. (Salzman - North Carolina)
W76-06278

PROBLEM OF SELECTING INDICES FOR THE RELIABILITY OF WATER SUPPLY AND SEWER NETWORKS, PART I (ZACADNIENIE WYBORU WSKAZNIKOW NIEZAWODNOSCI SYSTEMOW WODOCIAGOWYCH I KANALIZACYJNYCH. CZESC I),
H. Kloss, and M. Rowan.
Gaz, Woda i Technika Sanitarna, Vol. 49, No. 10, p 305-307, October, 1975. 1 fig.

Descriptors: *Model studies, *Water supply, Economics, Repairing, Equipment, Design criteria, Mathematical models, Networks, *Sewers.
Identifiers: *Poland.

Definitions and models of reliable and efficient water supply systems and their elements were discussed. Supplying data on the over-all and precise workings of technical objects from an economic viewpoint, the Central Bureau of Standards in Warsaw, Poland, furnished the indicators of reliability properties. According to the Bureau, all technical objects could be divided into reparable and irreparable categories. The definition of the former was an object which could be repaired for damages, and the definition of the latter was an object for which no repairs could be anticipated, even in the event of reversible damage. The category in which the object under discussion will be included is often decided by the user. In accordance with Soviet standards, reliability of an object is evaluated by the total number of such properties as suitability, durability, reparability,

resistance to storage, and preservation of inherent functional properties. The Central Bureau of Standards elaborated on these definitions. On their basis of the properties indicated, a number of mathematical equations were developed in order to calculate the probability of proper function of technical objects under various conditions. (Tallert-FIRL)
W76-06313

GOVERNMENT-CONTRACTOR-ENGINEER LIASON THAT CREATES AN ECONOMICAL PROJECT,
V. von Buchstab.
Engineering and Contract Record, Vol. 88, No. 13, p 40-42, Fall, 1975. 1 fig.

Descriptors: *Sewers, *Water treatment, *Treatment facilities, *Construction, *Economics, Engineering, Construction equipment, Governmental interrelations, Sewage treatment, Planning, Canada, Waste water treatment.
Identifiers: York Durham water and sewer project(Toronto).

The York-Durham water and sewer project in the Toronto region is under construction and will support 170,000 new homes and increased industrial development. The project is unusual because contractor-owner-engineer negotiations are being conducted and the contracting industry has been asked to contribute input to the final specs before official bidding. This liason between government, contractors, and engineers should help develop economic and viable construction methods. The contracting industry is in close contact with equipment suppliers and tends to be knowledgeable about improvements in technology. In addition, when bids are put out during slow business periods, they tend to be more carefully written. Additionally, the advent of a standardization policy has helped in coordinating discussion and planning recommendations. (Kramer-FIRL)
W76-06319

THE FUTURE OF WATER RESOURCES,
Wessex Water Authority, Bristol (England).
K. Jackson.
Chartered Municipal Engineer, Vol. 102, No. 11, p 216-218, November, 1975.

Descriptors: *Water sources, *Water supply, Water management(Applied), Administration, Rivers, Aquifers, Groundwater, Surface waters, Desalination, Recharge.

Because of the prediction that by the end of the century demand for public water supplies may double, the newly established Water Resources Board of England and Wales has had to consider long-term schemes for supplying water. At present, river abstraction and regulation of river flow provides most water supplies. In heavily populated areas such as London, water from a river outside the area, such as the River Severn, may have to be piped to the Thames to regulate the flow and increase the London water supply. One such scheme is already under way: a link between the rivers Tyne, Wear, and Tees will supply the Northumbrian Water Authority area with water until the end of the century. Another form of river regulation being developed involves pumping water from underground strata to augment the river flow. This plan is currently being developed to augment the River Thames. Artificial recharge is a solution that involves feeding surface water into underground strata to improve the yield of boreholes sunk into the aquifer. This system utilizes natural storage as opposed to costly manmade storage. The idea of developing estuary storage by the construction of barrages is thought to be prohibitively expensive. Desalination is also too expensive to warrant use in England. Low-quality water supplies could be piped to industries and good quality sources could be reserved for drinking water. Combinations of these solutions could provide sources in excess of the sum of the separate yields if each source is operated in isolation. (Loustau-FIRL)
W76-06324

INSTRUMENTS FOR WATER AND SEWAGE TREATMENT PLANTS (JOGESUIDO KEISO KIKI),
Tokyo Shibaura Electric Co., Ltd. (Japan).
For primary bibliographic entry see Field 7B.
W76-06347

MONOGRAPH FOR THE EFFECTIVENESS AND COST OF WATER TREATMENT PROCESSES FOR THE REMOVAL OF SPECIFIC CONTAMINATS, VOLUME II, KWIK INDEX,
Volkert (David) and Associates, Bethesda, Md.
I. C. Watson, S. J. Spano, H. N. Davis, and F. M. Heider.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 443, $5.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-430/9-75-008, August, 1974. 83 p. 68-01-1833.

Descriptors: *Potable water, *Treatment, *Water treatment, *Waste water treatment, *Indexing, Bibliographies, Publications, Information exchange, Costs.
Identifiers: KWIK Index.

Information is presented on treatment processes for potable water supplies and their costs. Volume II consists of a KWIK Index which provides additional references for more detailed information on treatments and costs. The purpose of the report is to be a general planning document to give the user general concepts on what treatment methods are available to remove specific contaminants or reduce them below the limits required or recommended by the 1974 Federal Drinking Water Standards and Guidelines. Physical, biological, chemical and radiological contaminants are covered. Cost estimate curves and procedures are outlined in Volume I. The KWIK Index in Volume II is divided into reference, subject and author sections. The reference section is organized numerically. The subject section lists subjects, titles and reference numbers which allow cross-referencing to the reference section. The author section lists principal authors and also refers to the reference section. (Pinto-FIRL)
W76-06350

THE CONTROL AND OPERATION OF NUCLEAR DESALINATION SYSTEMS,
New South Wales Univ., Kensington (Australia). School of Nuclear Engineering.
For primary bibliographic entry see Field 3A.
W76-06426

AUTOMATIC WATER DISTILLER,
C. C. Dennison.
U.S. Patent No. 3,935,077, 5 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1867, January 27, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, *Water pollution treatment, *Water pollution control, *Distillation, Condensation, Evaporation, Domestic water, Condensors, Evaporators.

The automatic water distillation apparatus described is primarily designed for domestic use although it can be employed for commercial use. The system uses both air and water to cause condensation of the steam produced by an electrical evaporator. By utilizing water to cool the steam prior to supplying it to the evaporator, the amount of energy required by the evaporator to convert water to steam is reduced. The water distillation apparatus includes a base having a removable shell. An insulated evaporator is enclosed within the shell and the base. A condensing chamber within the shell above the insulated evaporator has steam transported from the insulated evaporator. A water cooling and preheating chamber is above the condensing chamber with the water cooling and preheating chamber having a common wall with the condensing chamber to provide heat exchange. Water is supplied to the water cooling and preheating chamber to aid in cooling the steam in the condensing chamber. The condensing chamber has its outer wall spaced from the shell to form a passage and the flow of air through the passage aids in cooling the steam in the condensing chamber. Distilled water produced by condensation of the steam in the condensing chamber is collected by suitable means. (Sinha - OEIS)
W76-06469

CLARIFICATION PROCESS,
Georgia-Pacific Corp., Portland,Oreg. (Assignee).
W. S. Briggs.
U.S. Patent No. 3,935,101, 11 p, 1 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1873, January 27, 1976.

Descriptors: *Patents, *Water treatment, Water quality control, Water pollution control, *Water pollution treatment, *Flocculation, Coagulation, Lignins, Settling basins, Suspended solids, Colloids, Chemical reactions, Separation techniques, Pulp wastes.
Identifiers: Lignosulfonates, Di-epoxides.

A clarification process for flocculation of solids suspended in an aqueous medium uses improved flocculating agents prepared from lignin and lignosulfonates. A water-soluble lignindi-epoxide reaction product is obtained by reacting a lignin with a long chain, terminal di-epoxide having a molecular weight in the range of from 120 to 18 to the extent that the phenolic hydroxyl content of the lignin has been reduced from about 40% to 95%. By reacting the lignin with a limited amount of epoxide under controlled conditions, cross-linking or bridging of the lignin by long chains is obtained resulting in formation of molecules having large entities held together at a distance from each other by non-rigid, flexible bonding. The products when dissolved in aqueous medium form loosely bound, flexible molecules having increased area for adsorption or entrapment of fine solid or colloidal particles in the solution or suspension to result in the flocculation of the particles. It is essential that the reaction be carried out under controlled alkaline conditions to prevent the lignin from reacting with the di-epoxide to the extent that the reaction product becomes water soluble. (Sinha-OEIS)
W76-06471

INTERIM PRIMARY DRINKING WATER STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06522

10,000,000 GALLON PER DAY SECONDARY REFRIGERANT FREEZE DESALTING PLANT,
Dravo Corp., Pittsburg, Pa. Blaw-Knox Chemical Plants Div.
For primary bibliographic entry see Field 3A.
W76-06549

5G. Water Quality Control

A MARGINAL COST BASIS FOR METROPOLITAN WATER SUPPLY ALLOCATION AND OPERATION,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W76-06164

THE ROLE OF GROUNDWATER IN RURAL SUPPLIES IN GHANA,
Ghana Water and Sewerage Corp., Bolgatanga.
For primary bibliographic entry see Field 4B.
W76-06169

PHILADELPHIA'S SOLID WASTES STRATEGY STRESSES PRIVATE SECTOR PARTICIPATION,
Philadelphia Dept. of Streets, Pa.
For primary bibliographic entry see Field 5E.
W76-06199

IMPLEMENTATION OF INTERSTATE WATER QUALITY PLAN,
Delaware River Basin Commission, Trenton, N.J.
C. H. J. Hull.
Journal of the American Society of Civil Engineers, Hydraulics Division, Vol. 101, No. Hy3, p. 495-509, 1974. 2 fig., 1 tab., 17 ref.

Descriptors: *Water quality standards, *Water quality control, *Interstate, *Delaware River Basin Commission, Comprehensive planning, Regulation, Administration, Self-purification, Low-flow augmentation, Encroachment, Saline water, Sewage districts, Estuaries.
Identifiers: Regional sewage facilities, Regional waste treatment.

An example of interstate regional water quality control is given by citing the scope and functions of the Comprehensive Plan of the Delaware River Basin Compact adopted by the Delaware River Basin Commission. The Plan includes policies, standards, criteria, and general goals, as well as physical projects and facilities deemed necessary by the Commission for water resources conservation, development, and management in the 13,000 sq mile four-state region. It is in effect a code of administrative laws and has the force of law. The use of the Basin's waters for controlled and regulated assimilation of treated wastes is recognized as a beneficial water use protected by the Comprehensive Plan. It includes provision of storage capacity for pollution abatement, for waste assimilation, and for control of seawater intrusion. The Commission has sponsored or participated in regional sewage treatment efforts and has established regional standards for DO levels. Compliance with the Basin's water quality plan is being effected by (1) consultative planning between the Commission and sponsors of water-related projects; and (2) formal detailed review of water-related projects before construction approval is granted. (Auen-Wisconsin)
W76-06201

FORMULATION AND USE OF PRACTICAL MODELS FOR RIVER QUALITY ASSESSMENT,
Geological Survey, Portland, Oreg. Water Resources Div.
V. G. Hines, D. A. Rickert, S. W. McKenzie, and P. P. Bennett.

Descriptors: *Performance, *Model study, River, **Water quality, Planning, Management, Mathematical models, Data collection, *Oregon.
Identifiers: *Willamette River(Ore).

Considerations vital to formulation and use of practical river quality models applicable to planning and decision making are described. Deficiencies in modeling rationale are discussed and suggestions made for improvement in order to provide a basis for examining potential shortcomings of proposed models. Mathematical model can be used for river basin planning and management if premises and limitations are recognized, the model properly formulated, calibrated, and verified. Environmental factors and processes affecting river quality must be scientifically appraised. Successful appraisal depends on the complexity of physical conditions in each river basin and available knowledge. Analysis of river hydrology (runoff, water temperture pattern, channel morphology) is essentially applied river quality model formulation. River hydrology is the most important single factor governing time and space variability in river quality behavior; it helps identify critical time period and reaches of the river for which a model may be effectively applied. Calibration and verification of models should be based on separate, statistically reliable data for variables and processes being modeled. To be valuable, model production runs must be understandable to users. The Willamette River, Oregon, data collection program is used to show the kinds of data required for river quality models. (Buchanan-Davidson--Wisconsin).
W76-06209

A COMPARATIVE STUDY OF CHEMICAL LOADINGS OF ACID AND NON-ACID TRIBUTARIES OF CHEAT LAKE, WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W76-06213

WATER HYACINTHS FOR REMOVAL OF PHENOLS FROM POLLUTED WATERS,
National Space Technology Labs. Bay St. Louis, Miss.
B. C. Wolverton.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-16128, $3.50 in paper copy, $2.25 in microfiche. NASA Report No. TM-X-72722, February 1975. 18 p. 3 fig., 3 tab., 30 ref.

Descriptors: *Absorption, *Water hyacinth, *Phenols, *Water pollution control, *Mississippi, Aquatic plants, Metabolism, Chemical wastes, Water pollution treatment.
Identifiers: Bay St. Louis(Miss).

Although water hyacinth (Eichhornia crassipes) is a serious aquatic weed problem in warm climates, it is a promising candidate for solving food supply, energy requirements, and water pollution problems. It is being investigated at the NASA National Space Technology Laboratories, Bay St. Louis, Mississippi, as a pollution abatement tool for removal of photographic and chemical laboratory wastes. The results of the study on the ability of water hyacinth to remove phenols from waters are described. Individual four-week and older plants were exposed to phenol in distilled water containing liquid plant food, East Pearl River water, or water from a Louisiana bayou. Recovery experiments indicated that water hyacinths removed phenol and rapidly metabolized it to other components. Translocation studies using C14 are in progress. Water hyacinths removed 36 mg phenol from distilled, river, and bayou water/g dry plant weight in 72 hours. One hectare containing approximately 1,620,000 plants could conceivably remove 160 kg phenol in 72 hours. A water filtering lagoon system is being built to test the use of water hyacinth and other vascular plants for pollution abatement. Hyacinth mats will be started in lagoons at various times as uptake is greater by plants in a rapid growth phase at pH 6.9-7.0. (Buchanan-Davidson--Wisconsin)
W76-06217

INVESTIGATIONS OF AQUATIC WEED CONTROL METHODS AND THEIR ENVIRONMENTAL EFFECTS ON NONTARGET AQUATIC SPECIES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 4A.
W76-06218

BIODETERIORATION OF NAVY INSECTICIDES IN THE OCEAN,
Civil Engineering Lab. (Navy). Port Hueneme, Calif.
For primary bibliographic entry see Field 5B.
W76-06219

THE ROLE OF POLLUTEE TAXES IN EXTERNALITY PROBLEMS,
Boston Coll., Chestnut Hill, Mass.
M. Kraus, and H. Mohring.
Economica, Vol. 42, No. 166, p. 171-176, 1975. 1 fig., 4 ref.

Descriptors: *Pollution taxes(Charges), Third party effects, Resource allocation, Equity, Indirect costs, Indirect benefits.

A serious problem exists in incorporating technological externalities in pollution taxes where de facto externalities involve multiple local optima and both complex and changing interrelations, due to the impossibly costly information requirements necessary to design a pricing system for externalities that would enable moving in one step from an existing, nonoptimum allocation of resources to a globally optimum allocation. The rationalizations for taxing pollutees (those damaged by technological externalities) as well as polluters by recursive taxing schemes are considered attractive only because of their small information requirements. The arguments posed by Coase (1960, p. 42), Baumol (1972), and Mohrin and Boyd (1971) for site relocation of pollutees or taxes on pollutees to account for the marginal pollution costs incurred by the pollutor due to the pollutees' locational decisions into the pollutor's environs, are assessed. The conclusions are that in a world of multiple local optima, neither sequentially adjusted polluter taxes alone nor such taxes coupled with sequentially adjusted site taxes on pollutees would be relied on to achieve a global optimum. And, there appears to be no inexpensive mechanism for obtaining global optimality in externality problems involving multiple local optima. (Auen-Wisconsin)
W76-06226

THE POLITICAL ECONOMY OF EFFLUENT CHARGES,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
T. A. Ferrar, and P. Sassone.
Working Paper No. 5, May 1974. 16 p. 2 fig., 14 ref.

Descriptors: *Pollution taxes(Charges), *Political aspects, *Equity, Industries, Effluents, Theoretical analysis.

It is posited that any environmental policy must pass certain political acceptability tests before it may be implemented and that political constraints effectively prohibit the construction of an optimal effluent charge. Two conditions are introduced that an effluent charge scheme would likely be required to satisfy and it is demonstrated that, in general, no optimal effluent charge that satisfies these conditions is available. (1) The traditionally accepted principle is that 'equals must be treated equally', i.e., any two firms producing the same effluent should face the same effluent rate structure. Under this principle it is mathematically demonstrated that the equity requirement is a severe restriction on the efficiency of effluent charges. (2) Alternatively, if it is required that each firm be held strictly self-accountable on its effluent behavior, under the self-accountability condition effluent charges also cannot yield socially optimal resource allocation if the cost function does not exhibit these conditions. It is pointed out that if this strict accountability condition is essential for operational policy, then only under this restrictive technological condition could an optimal effluent charge policy be established. It is not proposed that no effluent charge policy should be implemented but rather the question posed is whether a specific policy is an improvement over available policy alternatives. (Auen-Wisconsin).

W76-06228

WATER CONTENT AND BULK DENSITY CHANGES IN A SOIL PEDON MEASURED WITH DUAL ENERGY GAMMA-RAY TRANSMISSION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. J. Reginato.
Can J Soil Sci. 54(3): 325-328. Illus. 1974.

Descriptors: *Soil density, *Soil water, *Measurement, *Water measurement, *Instrumentation, Soil profiles, *Soil density probes.
Identifiers: *Gamma-ray transmission technique, *Pedon.

Water contents and bulk densities were measured in a soil pedon with a gamma-ray transmission technique utilizing 137Cs and 241Am. By alternating the sources for each scan down the soil profile, both bulk density and water content were determined in 1-cm increments in the top 10 cm of the pedon. Bulk density decreased to a depth of 6 cm about 30 min after 4 cm of water was ponded on the soil surface. As soon as the water drained from the surface, bulk density values increased and approached pre-irrigation levels. Water content increased rapidly corresponding to the decrease in bulk density. Assuming that the bulk density remains constant during ponding, calculated water contents may be in eror by as much as 0.25 gcm-3.--Copyright 1975, Biological Abstracts, Inc.
W76-06238

THE ROLE AND FUNCTION OF VERDURE IN PROTECTING THE HUMAN ENVIRONMENT.
Polskie Towarzystwo Przyrodnikow im. Kopernika, Warsaw.
For primary bibliographic entry see Field 4C.
W76-06240

DEVELOPMENT OF AN ECONOMIC/ENVIRONMENTAL PLAN FOR DENTS RUN WATERSHED, WEST VIRGINIA.
Halliburton Services, Duncan, Okla.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 671 $4.50 in paper copy, $2.25 in microfiche. Final report. Prepared for the Appalachian Regional Commission, Washington, D.C. March 1973. 75 p, 11 fig, 2 tab, 4 ref. EPA 14010-HQC-2.

Descriptors: *Pollution abatement, *Watershed management, *Solid wastes, Environmental sanitation, *Environmental control, *Coal mine wastes, *Sewage disposal, *Costs, Air pollution, Water pollution control, *West Virginia.
Identifiers: Dents Run(WV), *Dents Run watershed(WV), Cost estimates, Junked cars.

This watershed of 14.6 sq mi contains two cities, Granville (population 1050) and Westover (population 5089). The very polluted flow of Dents Run consists of water from coal mining operations or abandoned mines, except during the rainy season. A survey to discover pollution sources revealed four main sources: sewage discharge into the Monongahela River and Dents Run, trash and garbage, junk cars, and coal mine fires. Plans for and costs of correcting environmental problems are discussed. Short range plans last up to six months and are mainly educational while long range plans require more initiation time, new laws or additional funding. Sewage disposal is the major problem. Aside from educational efforts, this will require the building of septic tanks at owner's expense at rural home locations, and a sewage treatment plant for urban locations. Four plans are given, each at a different capital and operating cost. Solid waste collection could be handled by towns individually or through a public service district. The recommended plan encompasses the entire county. This serves the most people at the lowest cost per person. Costs for removing junked car bodies are expected to exceed the value of the cars, so that government or private help is needed to locate cars, determine ownership, acquire the rights and haul to a shredder. The last problem surveyed was that of extinguishing burning coal outcrops. Coal mine operators may extinguish the fires as a 'good neighbor policy'. Otherwise it must be done at public expense. Cost estimates for work, sources of funds, and authorities involved are presented. (Smith - North Carolina)
W76-06270

AN APPROACH TO A WATER QUALITY INDEX FOR CANADA,
Department of the Environment, Ottawa (Ontario). Science Policy Branch.
H. Inhaber.
Water Research, Vol. 9, p. 821-833, September 1975. 14 fig, 5 tab, 7 ref.

Descriptors: *Water quality, Pollutants, *Standards, *River basins, *Industrial wastes, *Municipal wastes, Water pollution, Water supply, Recreation, Water quality standards, Mercury, Data, Metals, *Canada.
Identifiers: *Water Quality Index (WQI), Industrial and Municipal Effluent Index, Ambient Water Quality Index.

A Water Quality Index (WQI) (part of an Environmental Quality Index) is conceptually similar to economic indices such as Gross National Product though more difficult to obtain because of problems of nonuniform and qualitative data. To construct an index data must be available on a national scale. Here each of several subareas was treated to cover a range of pollutants. They were designed to reflect the magnitude of polluted effluent, the effect of pollution abatement, and some secondary effects such as contamination of water supplies and fisheries. Subindices obtained are combined mathematically through the root-mean square method which accentuates values farther from the mean. Group 1 is the Industrial and Municipal Effluent Index which covers municipalities and 4 major Canadian industries (petroleum refining, pulp and paper, fish processing, and chlor-alkali). To include different wastes in a combined index the constituents were rated relative to one another on the basis of the estimated importance of their effect on 3 water uses, suitability for drinking, fish and aquatic life, and recreation. A most stringent criterion was used to state the minimum concentration of a waste at which any of the water uses would be impaired. Group 2 is the Ambient Water Quality index which deals with trace metal contamination of water supplies, river quality in terms of turbidity, and mercury contamination of fish landed commercially. The indices are combined mathematically. Because of lack of data, it has not yet been possible to compile an overall quality index for specific rivers or basins. (Smith - North Carolina)
W76-06272

PLANNING A MUST FOR GROUNDWATER DEVELOPMENT,
Clinton Bogert Associates, Fort Lee, N.J.
For primary bibliographic entry see Field 4B.
W76-06273

USING WASTEWATER SOLIDS TO RECLAIM STRIP-MINED LAND,
Metropolitan Sanitary District of Greater Chicago, Ill.
H. McMillan, and R. Carlson.
Transactions of the Society of Mining Engineers, Vol. 258, No. 4, p 273-278, December, 1975. 4 fig, 5 tab, 5 ref.

Descriptors: *Land reclamation, *Waste water treatment, *Strip mines, Waste disposal, Sludge disposal, Acid mine water, Liquid wastes, Crops.
Identifiers: Land application, Chicago(Ill).

To cope with 700 dry tons of waste water solids produced each day, the Sanitary District of Chicago chose land application, and conducted tests before initiating a strip-mined land reclamation program. One demonstration project undertaken by the Sanitary District showed that annual yields of corn were consistently higher with sludge application than without it. Another demonstration involved reclamation of acid strip-mined land. Applications of liquid sludge supported cover crops while the control with no sludge did not. Samples of drainage water from the mine showed that the vegetation growth retarded the rate of acid production. The pH of the surface soi after liquid application was high enough to keep the metals from going into solution. A so phisticated research project was conducted at the University of Illinois. Drainage water from plots of various soils treated with liquid waste wa analyzed. After passage through a natural sand filter, drainage water consistently contained les than the standard limit for nitrate. Addition fiel experiments with corn and soybeans showed tha the liquid fertilizer was an effective source o nitrogen and phosphorus for crops. Encouraged b the results of the University tests and its ow demonstration program, the Sanitary Distric purchased 10,000 acres of land that had been strip mined for coal. The Sanitary District plans t apply 75 dry tons of sludge per acre the first yea 60 tons the second year, 45 tons the third year, an 30 ton the fourth year, at which point the progra will be reevaluated. (Loustau-FIRL)
W76-06287

THE WATERSHED APPROACH TO UN DERSTANDING OUR ENVIRONMENT,
Agricultural Research Service, Fort Collins, Colo
D. A. Woolhiser.
Journal of Environmental Quality, Vol. 4, No. 1, 17-21, January/March, 1975. 2 fig, 25 ref.

Descriptors: *Model studies, Watersheds(Basins Water management(Applied), Mathematic models, Runoff, Decision making, *Agricultur watersheds.

Current approaches used in modeling the agricu tural watershed include the formal, mathematic model and the material, representational mod Formal models allow predictive statements to made; material models provide interpretation three-dimensional flow in a porous medium w surface runoff, but are simpler to work with th the real system. Formal models consisting of s of partial differential equations can be simplifi by reducing their dimensionality to one space, treating groundwater flow as a steady-st problem, and by using 'lumped' or compartm models to eliminate spatial variability. N homogeneities or spatial variability can be cluded in a material model. The model would fi include spatial variability and then would modified so that such variability would averaged in some sense. Models are used in decision-making process; therefore, they must clude only the most important of subprocesses volved or they will become unduly cumberso When a model is developed for one purpose cannot be used for another application. (Loust FIRL)
W76-06311

WATER-SAVING DEVICES: THE STATE THE ART,
Pennsylvania State Univ., University Park. Sch of Forest Resources.
For primary bibliographic entry see Field 3D.
W76-06317

A FRAMEWORK FOR EVALUATING INSTI TIONAL AND SOCIO-ECONOMIC ISSUES LAND TREATMENT OF WASTE WATER,
Economic Research Service, Upper Darby, Natural Resource Economics Div.
L. A. Christensen.

ournal of Environmental Quality, Vol. 4, No. 2, p 45-153, April/June, 1975. 1 fig, 1 tab, 27 ref.

Descriptors: *Waste water disposal, *Nutrient emoval, *Regional planning, Land management, Land development, Management.
dentifiers: Land application, Socioeconomic lanning.

Land treatment involves the application of waste vater to vegetation producing land for adsorption f nitrates and phosphates by soil and plants. To ncourage a multidisciplinary approach to land reatment planning, some institutional and socio-conomic issues are highlighted here through a iscussion of alternative means of acquiring and anaging land treatment sites. If a public agency urchases the land by fee simple acquisition, anagement can be handled by subcontracting for ustom farm operations, or the land can be leased o farmers. The land can also be resold for private se with some legitimate conditions. Easement urchase, or partial property rights purchase, is nother alternative which has the advantage that anagement is left in the hands of the private wner. A new approach to land access is municipal nd private cooperative ownership with division of anagement costs. Some examples are given of xisting systems and their management. (Loustau-IRL)
776-06320

ATER QUALITY MANAGEMENT FOR ETROPOLITAN KANSAS CITY,
lack and Veatch, Kansas City, Mo.
. J. Schmidt.
ournal of the Environmental Engineering Divi-on, Proceedings of ASCE, Vol. 101, No. EE6, p 5-946, December, 1975. 5 fig, 3 ref.

escriptors: *Water quality control, *Sewerage, Planning, *Kansas, Missouri, Municipal wastes, unicipal water, Waste water treatment, State ju-sdiction.
entifiers: *Kansas City(Mo).

ack of centralized sewerage planning for etropolitan areas has resulted in problems of in-lequate facilities, untrained operators, and ex-nsive duplication costs. This study of the etropolitan Kansas City water treatment systems ints to the new and much-needed trend toward ified water treatment planning and management r metropolitan areas. The specific problems en-untered in the Kansas City metropolitan area ere watersheds crossing state lines and differing licies of the two states for treatment. Seven op-ns for managing the eight counties on both sides the Kansas-Missouri line were developed by ack and Veatch, Consulting Engineers. These tions include organizing a water management ency for the entire metropolitan area, organizing encies along county lines, and organizing agen-s along watershed districts. Because interstate operation might still be difficult to achieve, a mbination county-watershed system of agencies s thought to be the most appropriate. Although islation already exists allowing interstate nagement, more legislation may be needed to engthen this power. Whatever design is chosen, s recommended that the number of management encies be reduced to as few as possible and that operation in planning and operating be en-uraged. (Loustau-FIRL)
76-06323

ALING WITH THE DISCHARGE MONITOR-G REPORT,
n Antonio Wastewater Treatment Plant, Tex.
. Holm.
ter and Sewage Works, Vol. 122, No. 12, p 62-December, 1975. 4 fig.

scriptors: *Monitoring, *Legislation, *Waste ter treatment, *Treatment facilities, Biochemi-oxygen demand, Suspended solids, Water lity control, Effluents, Texas.

Identifiers: Effluent discharges, San Antonio(Tex).

Some problems of the discharge monitoring report, EPA Form 3320-1 (10-72), were solved by the San Antonio Waste Water Treatment Plant. A work sheet, a smaller, more concise version of the EPA Form, was prepared on 8-1/2 by 11 inch paper. Examples of the large form and the work sheet are reproduced in the article. A form letter, also reproduced in the article, was then prepared for weekly reports. Details of reporting and recording are given. For plants which have not yet made the calculations for the biochemical oxygen demand and the total suspended solids loadings, the computation is as follows: the effluent quantity in mgd is multiplied by the parameter effluent concentration in mg/liters; that product is then multiplied by a conversion factor of 3.785 to obtain the loading in kg/day. The conversion factor results from multiplying 8.345 pounds per gallon by 0.4536 kilograms per pound. (Loustau-FIRL)
W76-06325

CONTROLLING POLLUTION FROM COMBINED SEWERS,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W76-06328

HOW THE GREAT LAKES WERE EVALUATED,
Great Lakes Basin Commission, Ann Arbor, Mich.
W. C. Sonzogni.
Environmental Science and Technology, Vol. 9, No. 10, p 929-928, October, 1975. 1 tab.

Descriptors: *Great Lakes region, Water management(Applied), Planning, Data collections, Government supports, Legislation, Environmental effects, Evaluation.

The Great Lakes Basin Framework Study produced 6,000 pages of report and appendices to provide a broad-scale analysis of resource needs and problems in the U. S. portion of the Basin. This article gives a brief description of the report and its 23 appendices (divided into six general categories). The first part concerns alternative frameworks. The second set of appendices give basic resource information. Water resources use and management is the topic of the third category. Land resources use and management is the fourth category. The fifth discusses economic, social, and institutional studies, laws, and policies, and the sixth discusses environmental quality. The main report is a general summary of the appendices. In addition, an Environmental Impact statement and a special critique of the Framework Study were prepared. The statement summarizes the impacts and possible adverse effects of the Framework Study's plans. A group of governmental agencies and public interest groups critically examined the issues and questions which arose from the Framework Study. The report provides information for scientists, engineers, planners, and conservationists. (Loustau-FIRL)
W76-06329

MANAGEMENT OF AN EFFECTIVE MAINTENANCE PROGRAM,
California State Univ., Sacramento. Dept. of Civil Engineering.
K. D. Kerri, and J. Brady.
Water and Sewage Works, Vol. 122, No. 11, p 56, November, 1975.

Descriptors: *Waste water treatment, *Operation, *Maintenance, *Storm runoff, Treatment facilities, Inflow, Infiltration, Water management(Applied), Administration.

Improper operation and maintenance of waste water collection systems can create many problems. Untreated waste water flowing down streets and water courses during stoppages and storms can cause health hazards. Lack of proper installation, preventive maintenance, surveillance, and repair programs can result in system failures. The collection system, lift stations, and treatment plants can produce odors. Shock loads that upset treatment processes can occur. Equipment and structures can become corroded. Use of a valuable portion of the capacity of the facilities can be taken up by inflow and infiltration. Problems from system failures can result in complaints from the public or from local officials. To effectively operate and maintain a waste water treatment plant, managers must establish a good set of procedures for planning and recording the activities of the maintenance program. Managers must also train their maintenance forces to apply these programs. (Loustau-FIRL)
W76-06333

PRACTICAL RESEARCH IN WATER POLLUTION CONTROL,
University Coll., Cardiff (Wales). Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-06340

HOW TO IMPROVE PLANT EFFICIENCY,
Environmental Protection Agency, Washington, D.C. Office of Water Programs Operations.
W. G. Gilbert.
Water and Sewage Works, Vol. 122, No. 11, p 58, November, 1975.

Descriptors: *Waste water treatment, *Treatment facilities, *Municipal wastes, *Monitoring, Government finance, Water quality standards, Legislation, Performance, Water pollution control.

A compilation of reports from surveys conducted over three years revealed that about one-third of the nation's municipal treatment facilities constructed with Federal grant assistance are not operating at their designed efficiency levels. To improve the efficiency and reliability of treatment facility performance, local, state and Federal programs must establish tighter control and monitoring. Operators must be well trained and certified. Violations of permit limitations must be pursued aggressively and corrected. Operational expertise must be applied to the planning and design levels. Plant performances must be monitored and evaluated. New and simplified laboratory procedures must be tested. Adequate operating budgets at the local level must be provided. Proper operation and maintenance of existing plants is essential for reaching and maintaining effluent quality standards. (Loustau-FIRL)
W76-06342

DETERGENT PHOSPHATE BAN YIELDS LITTLE PHOSPHORUS REDUCTION, PART II,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
J. E. Etzel, J. M. Bell, E. G. Lindermann, and C. J. Lancelot.
Water and Sewage Works, Vol. 122, No. 10, p 91-93, October, 1975. 8 fig, 6 tab.

Descriptors: *Legislation, *Detergents, *Phosphates, *Phosphorus, Waste disposal, Eutrophication, Bioassay, *Indiana, Rivers, Nutrient removal, Sewage disposal, Sewage treatment.

The legislative ban in Indiana on detergent phosphates has failed to reduce the remaining stream phosphorus to levels low enough to be of any biological significance in reducing the potential for algal growth. Results of a 1974 study show that despite the existence of the statewide ban for 1.5 years, mean total-P concentrations are 110 to over 2000 ppb throughout the studied rivers. This

is considerably higher than the 10 to 50 ppb generally considered to be the range in which phosphorus can limit excessive algal growth. Laboratory bioassays all failed to show a positive growth response to phosphorus spiking. No correlation was found between total phosphorus levels and observed fertilities in the studied rivers. Data for specific sections of rivers studied are given in tables. It has been found, however, that nutrients can be reduced from sewage treatment plant discharge through flocculation. (See also W76-03235 and W76-06346) (Loustau-FIRL)
W76-06345

DETERGENT PHOSPHATE BAN YIELDS LITTLE PHOSPHORUS REDUCTION, PART III,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
J. E. Etzel, J. M. Bell, E. G. Lindemann, and C. J. Lancelot.
Water and Sewage Works, Vol. 122, No. 11, p 68-70, November, 1975. 1 fig, 2 tab, 11 ref.

Descriptors: *Water quality control, *Legislation, *Phosphates, *Detergents, *Indiana, Biological treatment, Sewage treatment, Water pollution effects, Chemical precipitation, Flocculation.
Identifiers: Legislative bans.

The legislative ban on detergent phosphates in Indiana has failed to reduce the remaining stream phosphorus to levels low enough to be of any biological significance. The results of the 1974 study that reveal the failure are detailed in tables and a graph. Whether or not the actual phosphorus concentration has been decreased is debateable but not the real issue. What is significant is that the ban limitations are still too high to limit algal growth. In addition, the ban on detergent phosphates may have confused the public of the overall objective. The idea that chemical precipitation is solely a phosphorus removal step is a misunderstanding. Chemical precipitation greatly increases the removal of all nutrients, including residual BOD, from treated sewage. The elimination of detergent phosphates alone has not upgraded the quality of treated water. Other phosphorus reductions must also be made, and chemical flocculation steps are needed in all treatment systems if the State's water quality standards are to be met. (See also W76-03235 and W76-06345) (Loustau-FIRL)
W76-06346

REGIONAL WASTE WATER DEVELOPMENT PLAN: ANALYSIS OF EXISTING FACILITIES.
Alamo Area Council of Governments, San Antonio, Tex.
For primary bibliographic entry see Field 5D.
W76-06351

SEWER/WATER PREFERRED LONG RANGE PLANS.
Northern Middlesex Area Commission, Lowell, Mass.
January 1972. 62 p, 5 fig, 4 tab, 5 append.

Descriptors: *Sewers, *Sewage districts, *Comprehensive planning, *Water distribution(Applied), *Water management(Applied), Sewage treatment, Water districts, Costs, Water demand, Utilities, *Massachusetts, Treatment facilities.
Identifiers: Northern Middlesex Area(MA), Billerica(MA), Chelmsford(MA), Dracut(MA), Dunstable(MA), Lowell(MA), Pepperell(MA), Tewksbury(MA), Tyngsborough(MA), Westford(MA), Merrimack River(MA).

The proposed sewer and water plan for Northern Middlesex Area is intended to serve as a basis for coordinating local efforts, as a framework for review of proposed projects, and as a major tool in the implementation of the future land use plan. As general utility policies, the following recommendations are made: (1) Major responsibility for administration of utilities should remain at the local level.A regional mechanism could reduce local costs by facilitating such activities as central purchasing, sharing of special equipment, and sharing of trained personnel. (2) Utility planning at the local level should be assisted by a continuous process of comprehensive planning. (3) Locations of future industries should be influenced by planning and zoning to minimize utility costs. (4) An advisory committee of experts, local citizens and officials should assist in planning and coordinating agreements between and among utility districts. Three subregional sewerage systems are recommended: Lowell-Tweksbury-Dracut, Billerica, and Chelmsford-Westford-Tyngsborough-Pepperell. On site disposal is appropriate for Dunstable. Joint commissions are to administer these regional systems and determine a fair accounting method for sharing cost savings. Water systems must be concerned with sharing sources of supply, future development of larger combinations of existing water supply systems, and inter-system connections and coordination. Beyond 1975 the zoned capacity of the Lowell water treatment plant will have to be expanded to meet demand. This need could be met by a regional water treatment plant or by a Northern Middles ex Water District built around facilitis on the Merrimack River.(See also W76-06353) (Henley-North Carolina)
W76-06352

SEWER AND WATER FACILITIES IN THE NORTHERN MIDDLESEX AREA, SHORT RANGE PRIORITY PROGRAM 1972-1977.
Northern Middlesex Area Commission, Lowell, Mass.
June 1972. 36 p, 3 tab, 1 map, 3 append.

Descriptors: *Sewers, *Water supply, *Water demand, *Water distribution(Applied), *Effluents, Pollution, Sewage treatment, Water quality, Water management, Planning, *Treatment facilities, *Massachusetts.
Identifiers: Northern Middlesex Area(MA), Merrimack River(MA).

This program has been developed to meet HUD's and EPA's requirements for establishing priorities for development of sewer and water facilities in order to maintain eligibility for capital grants. Its first concern is to provide a coordinated regional framework for the development of necessary waste treatment facilities directed at eliminating the dumping of untreated sewage into waterways. The Massachusetts Division of Water Pollution Control has issued schedules for the correction of raw sewage discharge to the communities of Lowell, Dracut, Chelmsford, Pepperell and Billerica. These areas then receive priority in the development of sewerage systems. The second priority level is concerned with eliminating possible health hazard areas and/or servicing areas of dense residential or commercial development. Knowledge of the complex factors which influence the water environment is far from complete. Deficiencies, gaps, and conflicts in the program are recognized. Federal, state and local governments and regional planning bodies are expected to participate in implementing the sewerage program. The second major concern is with the development of a short range (5 years) priority water systems program. Ground water supplies are becoming increasingly insufficient and unsafe. More communities are turning to the Merrimack River for their water supply. Possible economies of scale are promoting community cooperation in capital investment programs for expanding treatment facilities. In order to meet the first priority of meeting the demand for water in areas suffering from continual or seasonal water shortage, capacity of the Lowell treatment plant should be increased by a least 100%. (See also W76-06352) (Henley - North Carolina).
W76-06353

MINE SPOIL RECLAMATION RESEARCH AT THE BELLE AYR MINE, NORTHEAST WYOMING,
Forest Service (USDA), Fort Collins. Colo. Rocky Mountain Forest and Range Experiment Station.
H. K. Orr.
In: Proceedings Fort Union Coal Field Symposium, April 1975, Billings, Montana, Montana Academy of Science, Billings, Vol. 3 p 304-307. 1 tab, 2 ref.

Descriptors: *Coal mine wastes, *Vegetation establishment, Mine hydrology, Overburden, Spoil banks, *Wyoming, Watershed management.
Identifiers: *Mine spoil reclamation, Surface coal mining, Vegetation reestablishment.

Surface mining of coal drastically alters plant-soil-water relationships. Gross effects are of concern to managers as well as means of minimizing undesirable impacts. Ground water impact are of special concern in the semiarid environment of the western Great Plains. Revegetation is a primary step in reclamation for control of surface runoff, erosion, sedimentation, and for aesthetics. Initial trials with shrubs and trees have been only moderately successful. Lack of moisture is a primary limiting factor. Reclamation requirements justify the design of additional cultural treatments to insure success of revegetation. (Forest Service)
W76-06361

TREND SURFACE ANALYSIS OF POWDER RIVER BASIN, WYOMING - MONTANA,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-06363

COAL MINE SPOIL AS A GROWING MEDIUM AMAX BELLE AYR SOUTH MINE, GILLETTE WYOMING,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
T. Yamamoto.
In: Third Symp. on Surf. Min. and Reclam., Vol p 49-61, 4 tab, 33 ref. NCA/BCR Coal Conf. an Expo. II (Louisville, KY, Oct. 1975) Nat'l Co Assoc. Washington, D. C.

Descriptors: *Land reclamation, Overburde *Wyoming, *Strip mines, Soil chemical prope ties, Soil physical properties, *Fertilit *Vegetation establishment, *Soil moisture.
Identifiers: Spoil salinity, AMAX coal min Campbell County(Wyo), Fort Union Formatio Wasatch Formation, Coal spoil reclamation.

The geologic materials overlying coal beds--call spoils after the coal has been removed--ha unique physical and chemical properties. They a not 'soil' in a pedologic sense, nor are they geol ically the same as the rock formations from whi they were derived. Their unique properties son times pose problems in revegetation attempts. A first step in understanding spoils, samples fr the AMAX Coal Company in Campbell Coun Wyoming were analyzed by standard agricultu soils analysis procedures. The spoils were ov burden from the Roland and Smith coal beds of Fort Union Formation. Coal from this format represents the greatest strippable deposit Wyoming. Although slightly more saline than surrounding natural soils, the spoil salinity is enough to severely limit plant growth or survi The general nutrient status of the spoils is low ideal plant growth, but the generally loamy text is favorable. Furthermore, the homogeneity physical properties and dressed spoil depth p vide a moisture reservoir capacity consistent w capacities of natural soils. Thus, favora response is anticipated from the AMAX sp material as a growing medium. (Forest Service)
W76-06364

EHAVIOUR OF OIL UNDER CANADIAN CLI-
IATIC CONDITIONS PART 1. OIL ON WATER
NDER ICE-FORMING CONDITIONS,
epartment of the Environment, Ottawa
Ontario). Inland Waters Directorate; and Depart-
ent of the Environment, Ottawa (Ontario).
/ater Quality Branch.
. F. Scott, and R. M. Chatterjee.
cientific Series No 50, 1975, 21 p, 15 fig, 16 ref, 8
ib, append.

escriptors: *Ice, *Oil, Water pollution sources,
/ater pollution, *Oil pollution, Investigations,
/ater pollution effects, Environmental effects,
nalytical techniques, Research and develop-
ent, Chromatography, Gas chromatography,
Pollutant identification, Monitoring.

il was poured onto a water surface under ice-
rming conditions. Weather conditions were
onitored continuously, as were the physical pro-
erties of the oil and the effect of the oil on its
hysical environment. Properties of the oil were
vestigated by gas chromatography and the fol-
wing forms of spectroscopy: neutron activation
gamma-ray), infrared, ultraviolet, visible and
uorescence. The weathering of the oil and its in-
uence on its environment were correlated with
e weather parameters. An estimated 50% of the
il had evaporated before the oil was covered with
ow, as determined by gas chromatographic anal-
sis and supported by neutron activation analysis.
biological assessment was conducted during the
llowing summer where the effect of the oil on
e pond was compared with the control pond. In
e oiled pond, the variety of biological species
as substantially less than in the control pond.
Environment Canada)
/76-06366

ANADA WATER ACT - ANNUAL REPORT,
973-74,
epartment of the Environment, Ottawa
Ontario).
or primary bibliographic entry see Field 6E.
/76-06369

EVIEW OF HEATED DISCHARGE MANAGE-
ENT AND CONTROL ALTERNATIVES,
NCE-THROUGH SYSTEMS IN LARGE
/ATER BODIES.
Iaclaren (James F.) Ltd., Willowdale (Ontario).
or primary bibliographic entry see Field 5B.
/76-06372

INE AND MILL WASTEWATER TREAT-
ENT.
nvironmental Protection Service, Ottawa
Ontario). Water Pollution Control Directorate.
or primary bibliographic entry see Field 5D.
/76-06373

ONTROL OF ABSTRACTION BY LAW,
or primary bibliographic entry see Field 6E.
/76-06423

/ATER QUALITY CONTROL SYSTEM OF
AGYVA RIVER BASIN,
esearch Inst. for Water Resources Development,
udapest (Hungary).
Ijjas.
/orking Paper No. 38, UNDP/UN Interregional
eminar on River Basin and Interbasin Develop-
ent, Budapest, Hungary, September 1975. 18 p,
equ, 10 ref. (United Nations, Department of
conomic and Social Affairs).

escriptors: *River systems, *Water quality con-
ol, *Linear programming, *Dynamic pro-
amming, *Simulation analysis, Optimization,
perating costs, Treatment facilities, Planning,
onstraints, Biochemical oxygen demand, Mathe-
atical models, Computer programs, Systems
alysis.

Identifiers: *Zagyva River basin(Hungary).

A long-term research program of the Institute of Water Management and Hydraulic Engineering at the Technical University in Budapest has been concerned with water quality control in river basins. A goal has been the introduction of water quality system tests into teaching, research work, and engineering practice. On the basis of published experience, mathematical models and computer programs have been developed for water quality system tests, including hydrology and water quality predictions, mathematical simulation of self-purification, water quality variation, and optimum development of water quality control systems. The developed models and programs have been tried in water quality system tests of the Zagyva River, which has its source and most of its catchment area in Hungary. Advantageous was the proposed construction of an automatic water management control system in the Zagyva basin, automatically recording a great many data to facilitate water quality system tests, and thus the development of a water quality control system. (Bell-Cornell)
W76-06430

SYSTEMATIC APPROACHES TO ENVIRONMENTAL IMPACT ASSESSMENT: AN EVALUATION,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W76-06431

TRANSIENT WATER QUALITY MODELING IN STREAMS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-06433

WATER QUALITY PLANNING STRATEGY,
Camp, Dresser and McKee, Inc., Boston, Mass.
G. R. Grantham, and T. E. Bailey.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR1, Proceedings paper No. 12060, p 11-22, April 1976. 8 fig, 11 ref.

Descriptors: *Water management(Applied), *California, *Control, *Coordination, *Planning, *Water quality, Water resources, Legislation, State governments.

The California State Water Resources Control Board created the Office of Technical Coordination (OTC) to coordinate and oversee the administrative and technical effort required for the formulation of a planning program to preserve and enhance the quality of the State's water resources. The project included the development of water quality planning for each of the 16 hydrologic basins. Begun in 1970, the program complies with Federal requirements initially established in 1970 and new requirements imposed in 1972 by PL 92-500 and with the State's Porter-Cologne Act. Both laws require the preparation of water quality control plans for the State's 16 basins. With the enactment of these laws, significant changes were required in current water resources management method and practices. The fundamental changes with the greatest impact were in the areas of multiagency coordination, use of multidisciplinary planning procedures, and implementation of a comprehensive step-wise planning strategy. (Bell-Cornell)
W76-06439

NUTRIENT TRANSFORMATIONS IN MASS CULTURES OF MARINE ALGAE,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-06441

HYDROLOGIC EVALUATION OF SALINITY CONTROL AND RECLAMATION PROJECTS IN THE INDUS PLAIN, PAKISTAN--A SUMMARY,
Geological Survey, Reston, Va.
M. J. Mundorff, P. H. Carrigan, Jr., T. D. Steele, and A. D. Randall.
Available from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, $2.95 in paper copy. Water-Supply Paper 1608-Q, 1976. 59 p, 4 fig, 2 plates, 9 tab, 43 ref.

Descriptors: *Water quality control, *Salinity, *Surface waters, *Groundwater, *Foreign projects, *Asia, Evaluation, Water supply, Water utilization, Irrigation, Reclaimed water, Water analysis, Water quality, Aquifer characteristics, Canals, Brackish water.
Identifiers: *Pakistan, *Indus Plain, *Tubewells.

Summarized are findings of a team of four specialists from the U.S. Geological Survey assigned to Pakistan under the auspices of the U.S. Agency for International Development during May to August 1972 for a hydrologic evaluation of Salinity Control and Reclamation Projects in the Indus Plain. Studies were related to climatology, surface-water hydrology, and the canal system, streamflow and sediment yields of the rivers; computer applications to hydrologic data; aquifer characteristics; tubewell performance; hydrology of shallow versus deep tubewells; well and well-screen design in the Indus Plain; evaluation of observed and anticipated trends in both private and public tubewell development; evaluation of water-quality programs, data analysis, and records, and computer coding of special water-quality data; and evaluation of water-level data, well discharge and specific-capacity tests and aquifer tests. The reclamation program, by pumping from tubewells, has been notably successful in lowering the water table, in providing supplemental water for irrigation and for leaching of salinized soils, and in improving crop production. Problems associated with reclamation include control of deterioration in performance of tubewells and their rehabilitation, local brackih or saline-water encroachment, and maintenance of a favorable salt balance in the groundwater system. (Woodard-USGS)
W76-06453

LOW DRIFT SPRAY NOZZLE,
Delavan Manufacturing Corp., West Des Moines, Iowa. (Assignee)
K. E. Reed.
U.S. Patent No. 3,934,823, 6 p, 13 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1789, January 27, 1976.

Descriptors: *Patents, *Waste water disposal, *Sewage effluents, *Irrigation, *Sprinkler irrigation, *Impaired water use, Irrigation practices, Water utilization, Irrigation efficiency, Application equipment, Nozzles, Fertilization, Pest control.

Low drift spray nozzles are used in the application of conventional herbicides, pesticides and other farm chemicals. Another application in which drift is critical is in irrigation type rigs in which partially treated sewage is applied to large tracts of land. Federal and local agencies have set limits in which drift must be confined to within 200-300 feet to the point of application. The method and nozzles of this invention are capable of utilizing substantially larger line pressures and yet generate large droplets which are not subject to drift. The liquid is formed in large droplets by imparting a swirling motion to the liquid in a chamber of the nozzle, passing the swirling liquid through a first orfice into another chamber of the nozzle which is larger in cross section than the orifice, and discharging the swirling liquid from the last mentioned chamber through a second orifice which is at least as large in cross section as the first orifice, whereby the discharged liquid forms a hollow geometric shape having large droplets of the liquid. (Sinha - OEIS)

W76-06467

APPARATUS FOR SEPARATING LOW-DENSITY LIQUID FROM A RELATIVELY MORE DENSE LIQUID SUBSTANTIALLY IMMISCIBLE THEREWITH,
Erdol-Raffinerie Neustadt G.m.b.H. and Co. (West Germany); and King-Wilkinson, Inc., Tulsa, Okla. (Assignee).
K. Disque, H. Holzgen, and P. Stauch.
U.S. Patent No. 3,935,103, 7 p, 8 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1874, January 27, 1976.

Descriptors: *Patents, *Oil pollution, *Waste water treatment, *Industrial wastes, *Oil wastes, *Water quality control, Oil industry, Water pollution treatment, Water pollution control, Water pollution sources, *Separation techniques, Application equipment.
Identifiers: Tilting.

An apparatus for the removal of a relatively light or low-density liquid from a heavier or relatively high-density liquid, especially the removal of oil from water, comprises a separation vessel in which the two liquids have stratified, and a floating trough whose edges, in an uncanted position of trough, lie just above the upper surface of the low-density liquid. A discharge arrangement is connected with the trough to carry off the liquid collected and the trough is provided at its ends with a pair of floats at least one of which is internally subdivided into at least two laterally spaced trim chambers connected by a tube or passage and connected with a source of compressed or pressurized gas and the atmosphere. Trim water or another liquid is displaced from one of the chambers into the other, thereby canting the trough and bringing one of its edges below the surface of the low-density liquid so that the latter can flow into the trough and be withdrawn. When the low density liquid is present in a large quantity the height of its layer is correspondingly large and the tilting or canting angle may be correspondingly increased so that the trough is rotated about its longitudinal axis to a greater extent. When the quantity of low density liquid is less, a smaller angle of canting or rotation may be effected. (Sinha - OEIS)
W76-06473

OIL SEPARATION AND RECOVERY METHOD,
F. Gallicia.
U.S. Patent No. 3,936,377, 4 p, 9 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 943, No 1, p 337, February 3, 1976.

Descriptors: *Patents, *Oil pollution, *Oil spills, Oil-water interfaces, Water pollution treatment, *Water pollution control, Water quality control, *Separation techniques, Skimming, Flow.
Identifiers: *Oil recovery, V-shaped troughs.

The oil collection and recovery device may be towed or may be propelled by a small craft or other means to skim along the surface of the water, or it may also be used in a stationary position. If towed, the inverted V-shaped troughs are designed to impact against the water and as a result of their inclined structure, the contaminated water flows downward through the water-oil interface with the oil rising to the trough vertices because of its buoyancy, and into a collection tank where further separation occurs. If the device is motionless, jets of water are used to force the oil downward along the inverted V-shaped troughs and into the separation chamber. Once in the chamber, the oil rises and is then pumped out to an oil storage means. The relatively depolluted water is forced downward by the pressure of the following liquid, through an egress duct where it is discharged from a vent forward of the inverted V-shaped troughs and below the water surface. Expelling the relatively depolluted water in this manner serves to induce a current in the oil polluted surface water causing it to flow toward the inverted V-shaped troughs. This induced current is particularly beneficial when the device is used in the stationary position. (Sinha - OEIS)
W76-06480

MARINE DISCHARGE CONTROL APPARATUS AND METHOD FOR TREATING FLUIDS ON A MARINE VESSEL,
Keene Corp., New York. (Assignee).
I. Bartik.
U.S. Patent No. 3,937,662, 6 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 943, No 2, p 817, February 10, 1976.

Descriptors: *Filtration, Waste water treatment, *Patents, *Oil pollution, Oily water, *Oil wastes, Water pollution treatment, Water quality control, *Water pollution control, *Separation techniques, *Filters, Coalescence, Fuels, Monitoring, Turbidity, Equipment.
Identifiers: Bilge water, Ballast water, Turbidity meters.

A method and apparatus for treating bilge and ballast water in a marine vessel operates automatically to clarify the water to the point that it can be discharged overboard without further treatment. Bilge or ballast water is pumped and supplied to a number of filter units arranged in series. The filter units, which are of a special type, provide for coalescing of the admixed fluids in individual droplets of substantial size so that the oil and water conventionally making up the bilge and ballast fluid will have a strong tendency to separate by gravity. The oil thus separated from the water is drawn off from the top of one or more of the units and delivered to an oil storage tank while the water runs sequentially through the filtering and coalescing units and yields up a fraction of the oil carried in each unit and is discharged from the final one of the filtering and coalescing units as substantially oil-free water. The water from the last of the filtering units is discharged overboard but immediately upon leaving the last of the filtering units is caused to flow through a turbidity meter which senses the degree of purity of the water (the amount of oil therein) and diverts the water away from the discharge line when the turbidity of the water exceeds a predetermined allowable maximum. (Sinha - OEIS)
W76-06483

METHOD FOR DETERMINING AND CONTROLLING LIQUID COOLING SYSTEM CHARACTERISTICS.
Brown and Root, Inc., Houston, Tex. (Assignee).
C. W. Weber, C. O. Rucker, P. L. Peavy, P. W. Woo, and J. Bear.
U.S. Patent No 3,937,973, 10 p, 5 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 943, No 2, p 908, February 10, 1976.

Descriptors: *Patents, *Cooling water, Reservoirs, *Industrial water, *Cooling, *Thermal pollution, Thermal powerplants, Thermal properties, Temperature, Water pollution treatment, Water quality control, Bodies of water, Flow characteristics.
Identifiers: *Cooling systems.

Methods are described for determining and accounting for the thermal characteristics of the cooling liquid in various types of cooling systems. Using the data provided, the flow pattern of a cooling reservoir may be controlled to maximize plant efficiency under various plant load conditions and under various climatological or meteorological conditions. Moreover, temperature standards for the discharge of cooling water into natural reservoirs may be met. The flow pattern of a cooling reservoir having a surface exposed to the atmosphere is represented by a number of water segments each representing a specified time interval, preferably equal time intervals. A thermal characteristic of the segments is determined at least periodically, preferably in response to the prevailing thermal transfer characteristics at the surfaces of the segments, and the flow pattern of the cooling reservoir is modified to accommodate the required cooling needs of the system and to prevent the discharge of cooling water into natural reservoirs if the thermal characteristics of the cooling water do not permit such discharge because of set standards. A method for at least periodically calculating the temperature of each segment from known and assumed thermal data through a trial iteration process is used. The system can also be used to determine the thermal characteristics of a natural body of water and to describe its responses to meteorological conditions. (Sinha - OEIS)
W76-06484

DECISIONS FOR DELAWARE: SEA GRANT LOOKS AT LEGAL ASPECTS OF OCS DEVELOPMENT,
Delaware Univ., Newark. Center for the Study of Marine Policy.
For primary bibliographic entry see Field 6E.
W76-06485

THE COMMON LAW OF PUBLIC NUISANCE IN STATE ENVIRONMENTAL LITIGATION,
For primary bibliographic entry see Field 6E.
W76-06488

EPA STANDARDS: HEALTH OR HEADACHE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5G.
W76-06489

EPA STANDARDS: HEALTH OR HEADACHE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. W. Schnare.
American Water Works Association Journal, Vol. 67, No. 9, p. 507-509 (1975). 3 p.

Descriptors: *Potable water, *Water supply, *Water quality control, *Public health, *Standards, Legal aspects, Water law, Federal government, State governments, Local governments, Governmental interrelations, Water quality, Water purification, Safety, Water quality standards, Water, Water resources, Regulation, Water pollution, Water pollution control, Water pollution abatement, Law enforcement.
Identifiers: *Safe Drinking Water Act of 1974, *National Interim Primary Drinking Water Standards.

The Environmental Protection Agency's interim primary drinking water standards require public water utilities to inform the public when any violation of a standard occurs. This requirement results in fear and confusion, and causes demand for some type of immediate action, none of which necessarily helps to achieve the goal of providing safe drinking water. A wiser plan would be to educate the public concerning the rationale behind each standard, the actual health risk involved in a violation of a standard and the means by which the water supply will be returned to compliance. Another weakness of the present policy is the prohibitive cost to local authorities of the surveillance requirements of the standards. These requirements should be reexamined to determine if their cost is justified by the potential health risk were they to be eliminated. (Nursey-Florida)
W76-06489

THE NATIONAL ENVIRONMENTAL POLICY ACTS FIRST FIVE YEARS,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 6G.
W76-06490

POLLUTION--RIGHT OF SHIPOWNER TO CONTRIBUTION FROM UNITED STATES WHERE NEGLIGENCE OF COAST GUARD WAS A CAUSE OF CASUALTY AND ENSUING SPILL. BURGESS V. THE TAMANO, 373 F SUPP 839 (D ME 1974),
J. D. Kimball.
Journal of Maritime Law and Commerce, Vol. 6, No. 4, p. 665-67 (1975). 3 p.

Descriptors: *United States, *Judicial decisions, *Ships, *Oil spills, *Costs, Oceans, Oil pollution, Water pollution, Water pollution sources, Navigation, Transportation, Water, Water law, Legal aspects, Coasts, Federal government, Commercial fishing, Damages.
Identifiers: *Suits in Admiralty Act, Standing(Legal), Sovereign immunity, Negligence, Torts.

The case of Burgess v. The Tamano arose out of the grounding of the tanker Tamano, which resulted in a major oil spill. The Coast Guard subsequently undertook to contain and remove the spilled oil. In its decision, the court held that the private plaintiffs, landowners, boat owners, and commercial fishermen, had standing to maintain an action for pollution damages against the United States. The government had contended that plaintiffs were not 'maritime interests' to whom the government owed a duty of care. Rejecting this argument, the court concluded that plaintiffs were entitled to sue under the Suits in Admiralty Act, even if they were not 'maritime interests'. A second major issue in the case concerned the vessel owners' right to contribution and/or indemnity. The court, following recent decisions, held that the owners had stated a viable claim for contribution. If they successfully established the joint negligence of the United States, the owners were entitled to contribution. However, the court held that the owners' claim for indemnification had no basis either in contract or in tort. In so holding, the court agreed with a prior decision that, although the government may be liable for negligence in the performance of cleanup activities, such liability cannot be based on a theory of breach of warranty. (Schilling-Florida)
W76-06493

NEBRASKA NPDES PERMIT REGULATIONS.
In: 1974 BNA Environmental Rep. 836:0661-70 Rules and Regs Pertaining to the Issuance of Permits Under the National Pollutant Discharge Elimination System, 1974). 10 p.

Descriptors: *Nebraska, *Permits, *Waste water disposal, *Water quality standards, *Waste disposal, Discharge(Water), Effluents, Water pollution sources, Water quality control, Waste water(Pollution), Radioactive waste disposal, Water pollution, Waste disposal, Waste treatment, Environmental effects, Administration, Administrative agencies.
Identifiers: Fact sheets, Public hearings.

Unless specifically exempted, all persons must obtain a National Pollutant Discharge Elimination System (NPDES) permit before they can discharge any pollutants from a point source into navigable waters of Nebraska. Before any final decision is made concerning the issuance or denial of the permit, the Nebraska Department of Environmental Control must make a tentative decision based upon existing standards adopted by the Environmental Control Council. Public notice containing specified information about the application and the tentative determination shall be made in a specified manner. If an applicant's potential discharge is over 500,000 gallons a day, the Department must also prepare a fact sheet describing proposed plans to be sent to any person or group upon request. After 30 days have elapsed from public notice, the Department may make its final decision. Whether a public hearing will be required before this final determination is made will depend upon attendant circumstances. If the application is given final approval, the conditions of each issued NPDES permit must comply with minimum applicable standards adopted by the Council. (Hoffman - Florida)
W76-06495

NEVADA WATER POLLUTION CONTROL LAWS.
In: 1974 BNA Environmental Rep. 841: 0101-07 (Nev. Rev Stats, Title 40, Ch 445, Secs 445. 131 through 445.354, 1973). 7 p.

Descriptors: *Nevada, *Radioactive waste disposal, *Waste water disposal, *Water pollution control, *Permits, Effluents, Monitoring, Penalties(Legal), Waste disposal, Waste treatment, Water quality control, Water pollution sources, Discharge(Water), Waste water(Pollution), Legislation, Regulation, State governments.
Identifiers: *Pretreatment standards.

Unless specifically exempted, all persons must obtain a permit before they can lawfully discharge pollutants from a point source into any Nevada waters. The procedural steps and requirements pertaining to the application for, issuance and revocation of this permit are set forth. If the application is approved, the conditions of each permit must comply with the following: effluent limitations; standards of performance for new sources; effluent standards, effluent prohibitions and pretreatment standards; and any more stringent limitations. Any permits issued will be for a fixed period not to exceed five years, and may be renewed if specified requirements are satisfied. Set forth also are provisions for monitoring and recording discharges. When violations are detected, and they are not corrected at the request of the commission, criminal and civil sanctions may be imposed. Notwith-standing any of the above provisions, no permit may authorize the discharge of any radiological, chemical or biological warfare agent or high level radioactive waste into state waters. A permit may be obtained, however, to discharge, deposit or dispose of such wastes underground in liquid or explosive form. (Hoffman-Florida)
W76-06496

OREGON WATER QUALITY CONTROL REGULATIONS.
Oregon Dept. of Environmental Quality, Salem.
In: 1975 BNA Environmental Rep. 886:0501-26 (Ore. Ad. Rules, Ch. 340 Div. 1, Subdivisions 2 thru 8). 26 p, 14 tab.

Descriptors: *Permits, *Oregon, *Water quality control, *Waste water treatment, *Water quality standards, Thermal pollution, Legislation, Hydrogen ion concentration, Fungi, Dissolved oxygen, Radioisotopes, Basins, Streams, Streamflow, Water pollution sources, Penalties(Legal), Waste water disposal.
Identifiers: *Receiving streams.

To prevent unauthorized pollution, Oregon requires that a permit must be obtained before a person may discharge wastes into state waters. The degree of waste treatment that will be required before allowing the discharge will depend on the uses made of the receiving stream, the size of the receiving stream and the presence or absence of other sources of pollution in the same watershed. Regardless of any of these factors, the waste treatment required will always be the highest and best practicable treatment available. In addition, no wastes may be discharged if such discharge will cause any waters of the state to fail to meet general or special water quality standards. The general water standards, which are applicable to all state waters, pertain to: dissolved oxygen content, hydrogen ion concentration, fungi development, thermal limits, radioisotope concentrations, and several other specified factors. The special standards, which are applicable to particular basins throughout the state are concerned with the same factors as the general standards; however, they will be controlling whenever there is a direct conflict. To assure compliance with all the provisions of these regulations, civil and criminal penalties are provided for any violations. (Hoffman-Florida)
W76-06497

WISCONSIN WATER POLLUTION CONTROL LAWS.
In: 1973 BNA Environmental Rep 951:0101-20 (Wisc Stats, Ch 144, as amended by Laws 1971; Ch 147, 1973). 20 p.

Descriptors: *Permits, *Wisconsin, *Water quality control, *Administrative agencies, *Waste water disposal, Regulation, State jurisdiction, Effluents, Sewage treatment, Monitoring, Public health, Administration, Water quality standards, Water resources development, Water pollution treatment, State governments, Administrative decisions.
Identifiers: Procedural requirements.

To determine the nature and extent of pollution in state waters, the Wisconsin Department of Resource Development is authorized to conduct a comprehensive water survey. The Department, which is created by this statute, shall serve as the central governmental unit in charge of protecting and improving the quality of state waters. The Department will be advised and kept abreast of local conditions and problems by newly established regional advisory boards. To achieve its statutory goals, the Department is given numerous duties and powers, including the authority to: adopt water quality standards; exercise general control over state waters; adopt rules pertaining to waste treatment facilities; and establish a water pollutant discharge elimination system (WPDES). As to the WPDES, the Department is directed to implement a permit system to control effluent discharges. The procedures for the application for, issuance and revocation of this permit are set forth. The statute also presents comprehensive regulations pertaining to: the operation of sewage disposal systems; the monitoring and inspection of all wastewater discharging facilities; and the procedural requirements relating to public hearings and public notice which are required by numerous sections of the statue. (Hoffman-Florida)
W76-06498

WISCONSIN DISCHARGE PERMITS REGULATIONS.
In: 1975 BNA Environmental Rep. 951:0501-05 (Wisc. Ad Code, Ch NR 200, 1974 as amended 1975; Ch NR 201, 1974 and Ch NR 220, 1974). 5p.

Descriptors: *Wisconsin, *Waste disposal, *Permits, Waste treatment, *Sewage effluents, Municipal wastes, Industrial wastes, Mining, Public rights, Effluents, Water pollution, Sewage disposal, *Waste water treatment, Environmental sanitation, Water quality control, Administration, Decision making.
Identifiers: *Permit systems, Point sources of pollution, Public hearings.

To protect the quality of Wisconsin waters, and in the absence of any special exemption, a permit must be obtained for the lawful discharge of any pollutant. The general filing requirements pertaining to the application for such a permit are set forth. The information contained in this application will be the basis for the denial or issuance of the permit and shall be made available to the public unless the information is designated as confidential. To aid the Environmental Protection Agency in the processing of these applications, special short form applications are available if the applicant is the owner or operator of a municipal wastewater system, agricultural operation, manufacture or mining establishment, or service, wholesale or retail establishment. If the facility will have the potential to handle 500,000 gallons of

discharge a day, the applicant cannot use the short form and must use the applicable standard form. Before a permit may be approved for an applicant required to use the standard form, the department must prepare a fact sheet containing specified information which must be sent to interested persons on request. Finally, the regulations list 42 categories of point sources for which effluent standards and standards of performance are to be adopted. (Hoffman-Florida)
W76-06499

WISCONSIN WATER QUALITY STANDARDS.
In: 1974 BNA Environmental Rep. 951:1001-08 (Wisc. Ad. Code, Chs. N.R. 102 thru 104, 1973). 8 p.

Descriptors: *Interstate, *Water types, *Wisconsin, *Federal Water Pollution Control Act, *Water quality standards, Thermal pollution, Recreation, Water pollution sources, Water supply, Permits, Waste water disposal, Waste water treatment, Streamflow, Mixing, Water policy, Water pollution.
Identifiers: *Antidegradation, *Mixing zones.

Pursuant to the Federal Water Pollution Control Act Amendments of 1972, Wisconsin promulgated water quality standards to aid in the prevention and abatement of water pollution. To assure that water quality meets minimum requirements, several general conditions are presented which must be met by all waters at all times. In addition to these general requirements, some waters must meet additional special standards, including: (1) thermal standards; (2) standards for fish and aquatic life; (3) standards for recreational use; and (4) standards for public water supply. Furthermore, the statute presents requirements relating to antidegradation, streamflow, and mixing zones. To aid in the enforcement of all of the above standards, a permit system is initiated which will pertain to all waste water discharges. To make the above water quality standards applicable, the statute designates uses and standards for all interstate and intrastate waters. For example, Fox River is designated to be used for recreation, waste assimilation, industrial supply, fishing, and irrigation. Thus, the water quality of fox River must meet the standards for recreational use and fish and aquatic life. Finally, with regard to intrastate waters, certain variances and additions for different districts of the state are presented. (Hoffman-Florida)
W76-06501

UTAH WATER QUALITY STANDARDS,
In: 1973 BNA Environmental Rep. 926: 0541-45 (Code of Waste Disposal Regs, Part II, 1965; as amended 1967 and 1968). 5p.

Descriptors: *Utah, *Water quality standards, *Colorado River, *Water quality control, *Classification, Upstream, Downstream, Water pollution, Legislation, Regulation, Hydrogen ion concentrations, Turbidity, Dissolved oxygen, Radioactive wastes, Biochemical oxygen demand, Beneficial uses, Economics, Social aspects.
Identifiers: *Antidegradation.

Because strict compliance with water quality standards would often allow uncontrolled pollution of exceptionally high quality waters, the state of Utah has adopted an antidegradation policy which requires that waters of a higher quality than current standards be maintained at that level. This policy may be relaxed if it can be affirmatively shown that economic and social factors make the current high quality level unrealistic. The regulation also recognizes the cumulative effects pollution may have. Thus, higher quality standards will generally be set for upstream waters than for downstream waters. No wastes may be discharged into state waters if such discharge would violate specific standards pertaining to the water body's classification. These standards, which vary for different classes of water, pertain to: radioactive limitations; hydrogen ion concentrations; organic chemical limitations; coliform limitations; dissolved oxygen; turbidity; and biochemical oxygen demand. An appendix to this statute presents guidelines for formulating water quality standards for the interstate waters of the Colorado River system. Because these waters are used for numerous purposes, maximum effort should be made to maintain the highest possible water quality level. To achieve this goal, provisions are presented pertaining to minimum quality criteria applicable to interstate waters at agreed state line sampling points. (Hoffman-Florida)
W76-06503

WASHINGTON WATER POLLUTION CONTROL LAWS,
In: 1973 BNA Environmental Rep. 941:0101-16 (Wash Rev Code, Ch. 90.48, amended by Laws 1971 and 1973; Ch. 90.50, 1971; Ch. 90.52, 1971 and Ch. 90.54, 1971). 16p.

Descriptors: *Washington, *Water pollution control, *Waste water disposal, *Permits, *Federal Water Pollution Control Act, Ecology, Economics, Waste treatment, Government finance, Effluents, Water quality standards, Watersheds(Basins), Facilities, Water pollution sources, Pollutants, Discharge(Water).
Identifiers: *Waste disposal systems.

To insure the purity of all state waters, the Washington water pollution control commission is directed to set up a comprehensive water pollution control program. As part of this program, the commission is authorized to set quality standards for all state waters and for substances discharged therein. Since the discharge of substances has been a major factor in water pollution, all persons must obtain a permit before they can lawfully discharge polluting substances into state waters. A permit must also be obtained before any person may operate a waste disposal system. The procedural requirements and steps involved in the application, issuance, and revocation of these permits are set forth. Because of the necessarily broad scope of an effective water pollution program, the commission is also given the powers to delineate and establish sewage drainage basins, to financially assist eligible recipients in the construction of water pollution control facilities, and to thoroughly investigate any incidents involving the unauthorized entry of oil into state waters. This statute also creates the department of ecology to serve as the State Water Pollution Control Agency for all purposes of the Federal Water Pollution Control Act (FWPCA). The department is authorized to participate in any programs of the FWPCA which will result in benefits to the state. (Hoffman-Florida)
W76-06504

WASHINGTON WASTE WORKS REGULATIONS.
In: 1973 BNA Environmental Rep. 941:0581-85 (Wash. Ad. Code, Ch 372-20). 5 p.

Descriptors: *Washington, *Sewage treatment, *Design data, *Permits, *Design standards, Facilities, Waste treatment, Construction materials, On-site tests, Monitoring inspection, Industrial wastes, Municipal wastes, Water supply, Topography, Legislation.
Identifiers: *Pump stations.

Because sewerage systems are continually being expanded, approval of a municipal sewerage system may be obtained from The Washington State Pollution Control Commission without the submission of detailed plans. However, the municipality must obtain approval of a report containing general layout map and construction specifications of the system. This layout map shall include the following items: boundaries; existing and proposed sewers; existing and proposed pump stations; topography and elevations; bodies of water; and public water supplies. Sewerage treatment works are generally built to meet a specific need. Consequently, before approval will be granted for its construction, an engineering report must be submitted. Because this report contains basic design data, and forms the basis for the preparation of the construction drawings, it will allow the commission to make an intelligent evaluation of the proposed project. To insure compliance with approved designs, the commission must make adequate and competent inspections during the construction period. Once the construction is complete and operation has begun, the owner must keep adequate records and must make such tests as are necessary to assure that the plant is operating at its highest practical efficiency. The statute also presents provisions pertaining to the construction and operation of industrial waste treatment works. (Hoffman-Florida)
W76-06507

WASHINGTON WATER POLLUTION CONTROL PLANNING REGULATIONS.
In: 1973 BNA Environmental Rep. 941: 0701-0 (Wash. Ad. Code, Ch 372-68). 5 p, 2 map.

Descriptors: *Washington, *Water quality control, *Planning, Watersheds(Basins), *Project planning, Administration, Water management(Applied), Administrative agencies, Capital costs, Facilities, Economics, Coordination, Legislation, Regional development, Environment.
Identifiers: Public hearings.

To insure a high quality of state water the Washington legislature has promulgated regulations pertaining to water pollution control and abatement plans for sewage drainage basins. The initial drainage basin plan will be prepared by the planning agencies having authority over a particular basin. This plan should include the following: (1) a statement of the purpose of the plan and a summary of its findings; (2) the basis for planning such as a description of the physical environment and projected social and economic growth; (3) an inventory of existing facilities and sources and characteristics of wastes; (4) a description of present and future water pollution control needs; (5) a capital improvements program; (6) formal and updating; and (7) other pertinent plan considerations. Once a plan has been prepared, it must be presented to the water pollution control commission for approval. If the commission tentatively approves the plan, a public hearing must be held to allow the public the opportunity to make oral statements. After this public hearing, the commission may make its final decision. If the plan subsequently requires amendment, specific procedures must be followed. (Hoffman-Florida)
W76-06508

WASHINGTON HEARINGS REGULATIONS.
For primary bibliographic entry see Field 6E.
W76-06509

WASHINGTON NPDES PERMIT PROGRAM REGULATIONS,
In: 1974 BNA Environmental Rep. 941:0781- (Wash. Ad. Code, Ch. 173-220, 1974, as amended 1974). 8 p.

Descriptors: *Washington, *Discharge(Water), *Permits, *Water quality control, *Water quality standards, State governments, Effluents, Water pollution sources, Administration, Administrative agencies, Legislation, Radioactive waste disposal, Waste water(Pollution), Environmental effects, Waste disposal, Waste water disposal.
Identifiers: *National Pollutant Discharge Elimination(NPDES), Permit, Public notice, Public hearings.

Unless specifically exempted, all persons must obtain a state National Pollutant Discharge Elimi

ion System (NPDES) permit before they can lischarge any pollutants from a point source into avigable waters of the state of Washington. Be- ore any final decision is made concerning the is- uance or denial of the permit, the Department of Ecology must make a tentative determination ased upon proposed standards set forth in the ap- lication. Public notice containing information bout applications and the tentative determination hall be made in a specified manner. If an appli- ant's potential discharge is over 500,000 gallons er day, the Department must also prepare a fact heet describing the proposed plans to be sent to ny person upon request. After allowing 30 days or the receipt of public comments, the Depart- ent may make its final decision. Whether a ublic hearing will be required before this final ecision is made will depend on attendant circum- tances. If the permit application is given final ap- roval, the conditions of each issued NPDES per- it must comply with applicable effluents limita- ons and water quality standards. (Hoffman-lorida)
/76-06510

/ASHINGTON WATER QUALITY STAN- ARDS.
n: 1974 BNA Environmental Rep. 941:1001-09 Wash. Ad. Code, Ch 173-201, 1973, as amended 973). 9 p, 1 tab.

escriptors: *Water types, *Washington, *Water uality control, *Classification, *Water quality tandards, Dissolved oxygen, Coliforms, Turbidi- , Temperature, Hydrogen ion concentration, adioactive wastes, Aesthetics, Toxins, Permits, ollutants, Administration, Legislation, State overnments, Penalties(Legal), Waste water isposal.
lentifiers: *Water classification.

n order to establish a comprehensive water quali- program, all Washington state waters shall be lassified as Class AA (extraordinary), Class A xcellent), Class B (good), Class C (fair), or Lake lass. Each of these classes will have specified equirements pertaining to the following water uality criteria: total coliform organisms; dis- olved oxygen; total dissolved gas; temperature; ydrogen ion concentration; turbidity; toxic, dioactive, or deleterious material concentra- ons; and aesthetic values. With these require- ents as a basis, state waters are classified in one the above five classes. Thus, if a particular river classified as Class B, all necessary steps must be ken to insure that the river meets Class B quirements. A list of all state waters, and their assifications are presented. To help enforce this rogram, the Department of Ecology shall set up a rmit system to control the discharge of polluting bstances. A surveillance program is authorized ascertain whether the conditions of any issued rmits are being followed. The department is also ven the power to issue regulatory notifications, ders, and directives to any person who is, in the partment's opinion, polluting or about to pollute ate waters. Civil and criminal penalties are pro- ded for the violation of any of the provisions of e statute. (Hoffman-Florida)
76-06511

ATER QUALITY STANDARDS--COLORADO VER SYSTEM (SALINITY CONTROL POL- Y AND STANDARDS PROCEDURE).
ivironmental Protection Agency, Washington, C.
Fed. Reg. 43721-23 (1974). 3 p.

escriptors: *Adoption of practices, *State vernments, *Colorado River Basin, *Water ality standards, *Salinity, Arizona, California, olorado, Nevada, New Mexico, Utah, Wyoming, deral Water Pollution control Act, Salts, reams, Drainage area, Diversion, Standards, Ir- ation, Agriculture, Management, Abatement.

This notice sets forth a policy of maintaining salinity concentrations in the Colorado River System at or below 1972 average levels. It also requires the Colorado River System states to promulgate water quality standards and a plan for meeting the standards. The first step will be the establishment of procedures within thirty days of the effective date of these regulations for the adoption on or before October 18, 1975, of water quality standards for salinity including numerical criteria and an implementation plan for salinity control. The goal of the plan shall be to achieve compliance with the adopted standards by July 1, 1983. Comments and suggestions of interested parties are summarized, as well as specific objections of the Sierra Club to the proposed regulation. (Segall-Florida)
W76-06512

EFFLUENT GUIDELINES -- STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
40 Fed. Reg., 7095-96 (1975). 2 p.

Descriptors: *Power system operation, *Waste water(Pollution), *Discharge(Water), *Recirculated water, *Regulation, Waste treatment, Waste water disposal, Water quality control, Water quality standards, Administration, Administrative agencies, Water pollution sources, Industrial wastes, Industrial water, Wastes, Environmental control.
Identifiers: Administrative regulations.

The Environmental Protection Agency herein amends and corrects subparts A through D of its Steam Electric Power Generating Point Source Category regulations. 'Blowdown' is defined as the minimum discharge of recirculating water for the purpose of discharging materials contained in the process, the further buildup of which would cause concentrations or amounts exceeding limits established by best engineering practice. 'Low volume waste source' is defined as waste water from all sources except those for which specific limitations are otherwise established. 'Recirculated cooling water' is defined as water which is first passed through the main cooling condensers for the purpose of removing waste heat from the generating unit, then through a cooling device for the purpose of removing such heat from the water, and finally passed again, except for blowdown, through the main cooling condensers. Various editorial and typographical errors are likewise corrected. (Welch-Florida)
W76-06513

INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
40 Fed. Reg. 7106-09 (1975). 4 p.

Descriptors: *Waste water(Pollution), *Waste disposal, Pollutants, *Federal Water Pollution Control Act, *Discharge measurement, Cooling water, Streams, Effluents, Permits, Rainfall, Runoff, Equipment, Industries, Data collections, Chemicals, Pollutant identification, Pollution abatement.
Identifiers: Contaminated non-process waste water, Process waste water, Point sources.

Amendments are proposed to the Inorganic Chemicals Manufacturing Point Source Category. The affected portions are Chlorine and Sodium or Potassium Hydroxide Production Subcategory,Hydrochloric Acid Production Subcategory, Nitric Acid Production Subcategory, Sodium Dichromate and Sodium Sulfate Production Subcategory, Sodium Metal Production Subcategory, Sodium Silicate Production Subcategory, and Sulfuric Acid Production Subcategory. Previously, point sources in these categories were required to achieve no discharge of 'process waste water pollutants'. Now it appears that the existing definition of process waste water may be overly broad since it can be construed to apply to waste streams other than those directly connected with the production effort. Accordingly the Environmental Protection Agency is proposing to add to these subparts a definition of 'contaminated non-process waste water' for the purpose of distinguishing between those pollutant bearing streams that are attributable to production and those ancillary streams that are not. The Agency has identified four ancillary sources of pollution from plants which should be controlled by available technology to which a no-discharge standard will not always be appropriate. The four sources and associated limitations on pollutant discharge are specified in the proposed amendments. (Segall-Florida)
W76-06514

TIRE AND SYNTHETIC SEGMENT OF THE RUBBER PROCESSING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
40 Fed. Reg. 7109-10 (1975). 2 p.

Descriptors: *Classification, *Water quality control, *Waste water disposal, *Waste water treatment, *Federal Water Pollution Control Act, *Effluent streams, Water quality standards, Water pollution control, Water pollution sources, Waste disposal, Water resources, Regulation, Administrative agencies, Administration, United States.
Identifiers: Administrative regulations.

Pursuant to the Federal Water Pollution Control Act, as amended, the Environmental Protection Agency herein proposes amendments to the effluent limitations and guidelines for existing sources, and standards of performance and pretreatment standards for new sources, for the tire and synthetic segment of the rubber processing point source category. The regulation clarifies which process waste water streams should be regulated, and distinguishes between process and nonprocess waste water streams in tire and inner tube plants constructed before 1959 which were not designed to segregate process waste water and nonprocess waste water. 'Process waste water' is defined as discharges from: soapstone solution applications; stream cleaning operations; air pollution control equipment; unroofed process oil unloading areas; mold cleaning operations; latex applications; and air conditioner receivers. A provision of the proposed regulation would control the cncentration of oil and grease in nonprocess waste water for tire and inner tube plants constructed prior to 1959. (Welch-Florida)
W76-06516

SOAP AND DETERGENT MANUFACTURING CATEGORY (PRETREATMENT STANDARDS FOR INCOMPATIBLE POLLUTANTS).
Environmental Protection Agency, Washington, D. C.
40 Fed Reg 7580-83 (1975). 4 p.

Descriptors: *Chemical oxygen demand, *Detergents, *Standards, *Treatment facilities, *Organic wastes, Federal Water Pollution Control Act(FWPCA), Pollutants, Waste water(Pollution), Discharge measurement, Oxygen, Degradation(Decomposition), Alcohols, Statistical methods, Construction, Design, Recycling, Evaluation, Biochemical oxygen demand.
Identifiers: *Discharge streams.

The Environmental Protection Agency (EPA) has proposed regulation concerning the revision of pretreatment standards for new sources. The proposal will supplant portions of the Soap and Detergent Manufacturing Point Source Category, establishing for the manufacture of certain detergents therein the standards of pretreatment for new sources which discharge to publicly owned

treatment works. After evaluations of information relevant to the discharge of waste waters of the soap and detergent manufacturing industry to publicly owned treatment works, the EPA proposes the following modifications to the pretreatment standards for new sources in the industry: (1) parameters and limitations will be referenced to the discharge stream from the affected source within a subcategory, not to finished products; (2) requirements for pretreatment will be defined in terms of a ratio of chemical oxygen demand (COD) to biochemical oxygen demand (BOD) of the discharge streams, as defined in the regulations and amendments; and (3) for waste streams with COD/BOD7 ratios greater than ten and COD content above specified levels, the pretreatment standards shall be as specified in this notice. (Segall-Florida)
W76-06517

EFFLUENT GUIDELINES AND STANDARDS - FERROALLOYS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
40 Fed Reg 8030-37 (1975) 8 p.

Descriptors: *Effluents, *Discharge(Water), *Waste water disposal, *Water quality control, *Federal Water Pollution Control Act, Regulation, Administrative agencies, Administrative decisions, Industrial wastes, Industrial water, Environmental control, Water quality standards, Wastes, Waste dilution, Water pollution control, Industrial plants, Pollutants.
Identifiers: Administrative regulations.

Pursuant to the Federal Water Pollution Control Act, as amended, the Environmental Protection Agency herein establishes effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources for the ferroalloy manufacturing point source category. The regulation provides control standards for the discharge of pollutants which reflect the greatest degree of effluent reduction which the agency determines to be achievable. The calcium carbide and electrolytic ferroalloys segments of the ferroalloys industry are divided into subcategories on the basis of water uses, waste control technologies, and waste water constituents. For each subcategory effluent limitations and standards of performance are established. An economic impact analysis revealed that the modest cost increases generated by compliance with the guidelines can be passed on without significantly effecting product demand and employment. (Welch-Florida)
W76-06518

FERROALLOY MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
40 Fed. Reg. 8038-41 (1975). 4 p.

Descriptors: *Federal Water Pollution Control Act, *Waste disposal, *Water pollution control, *Pollutants, *Effluents, Waste disposal, Environmental effects, Regulation, Legislation, Water quality, Administrative agencies, Adoption of practices, Waste water(Pollution), Federal government, Sewage treatment, Treatment facilities, Environmental control, Treatment.
Identifiers: Administrative regulation.

The Environmental Protection Agency has proposed amendments to Chapter 40 of the Code of Federal Regulations concerning effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources for the ferroalloys manufacturing point source category. The proposed amendment will add a 'covered calcium carbide furnaces with wet air pollution control devices' subcategory to the other calcium carbide furnaces subcategories. Section 307(b) of the Federal Water Pollution Control Act requires such regulation standards for pollutants introduced into publicly owned treatment works, and federal regulations require that EPA propose such specific pretreatment standards at the time effluent limitations are established for point source discharges. The amendment includes both pretreatment standards for existing and new source discharges and standards of performance for new source discharges. The pretreatment regulation proposed applies to the introduction of pollutants which are directed into a publicly owned treatment works rather than those discharged into navigable waters. (Welch-Florida)
W76-06519

EFFLUENT LIMITATIONS AND GUIDELINES - PRINTING INK FORMULATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
40 Fed. Reg. 8307-11 (1975). 5 p.

Descriptors: *Federal Water Pollution Control Act, *Landfills, *Classification, *Waste treatment, *Waste water treatment, Regulation, Solid wastes, Liquid wastes, Water pollution sources, Water quality control, Legislation, Navigable waters, Waste disposal, Ultimate disposal, Economics, Environmental control, Energy dissipation.
Identifiers: *Printing ink, *Liquid concentrates.

Pursuant to the Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) is publishing proposed regulations concerning the oil-base ink subcategory and water-base ink subcategory of the printing ink formulating point source category. The printing ink category was divided into these subcategories primarily because of differences in their waste water treatability. The EPA found thaT the best practicable control technology currently available for both subcategories is no discharge of waste water pollutants into navigable waters. The most commonly employed systems by which the standard is obtained in each subcategory is presented. The best available and practicable control technology also requires that pollutants removed from waste water be disposed of in the form of solid wastes and liquid concentrates. Although most of the pollutants removed are non-hazardous some are hazardous; therefore, special care should be taken when selecting landfill sites. The precautions and factors that should be considered in making such site selection are presented. Provisions are also set forth relating to the impact of these regulations on cost estimates; energy requirements; environmental control; standards of performance for new sources; and pretreatment standards for new sources. (Hoffman-Florida)
W76-06520

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
40 Fed Reg 8514-29 (1975). 16 p, 14 tabs.

Descriptors: *Waste water treatment, *Classification, *Federal Water Pollution Control Act, *Copper, *Water quality standards, Legislation, Copper compounds, Wastes, Discharges(Water), Pollutants, Waste water disposal, Waste treatment, Waste disposal, Waste water(Pollution), Regulation, Administrative agencies, Effluents.
Identifiers: *Nonferrous metals, Point source pollution.

Pursuant to the Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) has promulgated effluent limitations and guidelines for existing sources for the primary copper smelting subcategory, the primary copper refining subcategory, the secondary copper subcategory, the primary lead subcategory, and the primary zinc subcategory of the nonferrous metals manufacturing point source category. The EPA is also proposing standards of performance and pretreatment standards for the above subcategories. The general methodology used in developing these limitations, guidelines and standards are set forth. Provisions pertaining to the waste characteristics and to the origin of waste water pollutants of each of the subcategories are also set forth. Finally, the regulations contain effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology economically achievable and effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available. (Hoffman-Florida)
W76-06521

INTERIM PRIMARY DRINKING WATER STANDARDS.
Environmental Protection Agency, Washington, D.C.
40 Fed. Reg., 11990-98 (1975). 9 p, 5 tab.

Descriptors: *Potable water, *Water quality standards, *State governments, Analytical techniques, *Water supply development, Organic compounds, Inorganic compounds, Coliforms, Turbidity, Pesticides, Sampling, Administrative agencies, Federal jurisdiction, State jurisdiction, Pollutants, Regulation, Legislation, Water supply, Analysis, Federal government.
Identifiers: *Safe Drinking Water Act.

As the first step in the implementation of the Safe Drinking Water Act (SDWA), the Environmental Protection Agency (EPA) is proposing regulations setting forth interim primary drinking water standards. These standards set maximum contaminant levels for the following: inorganic chemicals; organic chemicals; pesticides; turbidity; and coliforms. To insure compliance with these standards, provisions are presented concerning sampling and analytical requirements for each of the above contaminants. In addition, the regulations set forth reporting requirements concerning the results of these analytical tests. The SDWA not only provides for the promulgation of water standards, but also provides for the promulgation of siting requirements concerning the location of new or expanded water supply systems. The EPA, however, does not have a veto power over the location of such systems, although state agencies may have such a power. Despite the above standards and requirements, the primary responsibility for the implementation of the Act will rest with individual states, rather than with the federal government. Thus, when the state demonstrates the ability to effectively implement the Act, the federal government will play only a passive role. (Hoffman-Florida)
W76-06522

NAT. RES. DEF. COUNCIL V. TRAIN (FEDERAL WATER POLLUTION ACT AMENDMENTS).
For primary bibliographic entry see Field 6E.
W76-06523

STOCK V. STATE (CONSTITUTIONALITY OF STATE ENVIRONMENTAL CONSERVATION ACT).
For primary bibliographic entry see Field 6E.
W76-06525

STATE EX REL STATE GAM COMM'N V. GOLD HILL IRR. DIST. (NO LIABILITY FOR RELEASING AQUATIC SOLVENT IN CANALS WHICH OVERFLOWED CAUSING FISHKILL).
For primary bibliographic entry see Field 6E.
W76-06529

NITED STATES V KENNECOTT COPPER ORP (VIOLATION OF STATUTORY EQUIREMENT TO IMMEDIATELY REPORT IL DISCHARGE INTO NAVIGABLE /ATERS).
or primary bibliographic entry see Field 6E.
/76-06541

OGNITIVE STRAWMAN: PUBLIC INPUT TO WATER RESOURCE PLANNING SYSTEM,
tah State Univ., Logan. Technical Committee of ie Water Resources Research Centers of the hirteen Western States.
or primary bibliographic entry see Field 6B.
/76-06548

EORIENTATION OF URBAN WATER ESOURCES RESEARCH, FINAL REPORT,
utger-The State Univ., New Brunswick, N.J. /ater Resources Research Inst.
or primary bibliographic entry see Field 6B.
/76-06553

EORIENTATION OF URBAN WATER ESOURCES RESEARCH, EXECUTIVE SUM-ARY,
utger-The State Univ., New Brunswick, N.J. /ater Resources Research Inst.
or primary bibliographic entry see Field 6B.
/76-06554

NVIRONMENTAL ASSESSMENT AND ESIGN: PROCEEDINGS OF A SEMINAR.
innesota Univ., Minneapolis. Water Resources esearch Center.
or primary bibliographic entry see Field 6G.
/76-06555

EDERAL ENVIRONMENTAL IMPACT TATEMENTS--A CASE STUDY,
rmy Engineer District, St. Paul, Minn.
or primary bibliographic entry see Field 6G.
/76-06557

ULTIVARIATE AND SEQUENTIAL TATISTICAL PROCEDURES IN THE IOLOGICAL ASSESSMENT OF WATER UALITY,
olorado State Univ., Fort Collins. Dept. of tatistics.
or primary bibliographic entry see Field 5A.
/76-06561

VALUATION OF POLLUTION ABATEMENT ECHNIQUES APPLICABLE TO LOST CREEK ND BROWN'S CREEK WATERSHED, WEST IRGINIA.
ckenheil and Associates Geo Systems, Inc., Pitt-urgh, Pa.
vailable from the National Technical Informa-on Service, Springfield, Va. 22161 as PB-242 722. .00 in paper copy, $2.25 in microfiche. Prepared r the Appalachian Regional Commission, ashington, D.C. October 31, 1973. 146 p, 5 fig, 11 b.

escriptors: Water quality, *Acid mine water, Coal mine wastes, Water pollution control, Reverse osmosis, *Environment impact, Alternative planning, Acidic water, Pollutants, ater pollution treatment, *West Virginia, Pollution abatement, Watersheds(Basins).
entifiers: Lost Creek(WV), Brown's reek(WV), Hamson County(WV), Clark-urg(WV).

his study is one of a series of reports concerning e development of an overall environmental pol-tion abatement plan for the Monongahela River asin. Primary objectives are to evaluate applica-e pollution reduction methods and provide recommendations as to least cost and best overall solutions to mine drainage problems. Study results are based on water quality data from previous investigations and on supplementary data gathered during this study. Conclusions are: that water quality of the creeks has improved significantly; that the 4 identified drainage sources discharge 4800 lbs/day acid load and 600 lbs/day iron load to the principal streams; that conventional surface reclamation and treatment are methods best suited for abatement; that a least cost abatement plan has been developed which would provide an 80% reduction in acid and iron loads; and that a long term plan of abatement has been developed which considers associated long-range environmental benefits such as 90% reduction in acid and iron loads, a reverse osmosis facility, a sewage treatment plant and aesthetic improvements in other areas of the watersheds. Primary recommendations are: that a program be implemented as soon as practical to perform the described surface reclamation work in accordance with established priorities; that a program to secure funds and obtain preliminary design data for treatment plant possibilities be started with emphasis placed on pursuing the long term plan for the watershed. (Salzman-North Carolina)
W76-06570

DEVELOPMENT OF A PRIORITY DETERMINATION PROCEDURE.
Rivkin/Carson, Inc., Washington, D.C.; and Edwards (Arthur) Associates, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-242 669, $5.25 in paper copy, $2.25 in microfiche. Prepared for the Appalachian Regional Commission, Washington, D.C., March 1972. 115 p, 11 fig, 4 append. 14010-HOC-1.

Descriptors: *Mine drainage, *Economic impact, *Pollution abatement, *Priorities, Methodology, *Decision making, Watershed management(Applied), *Investment, Water pollution control, Air pollution, Soil contamination, River basin development, Environment, Maryland, Pennsylvania, West Virginia.
Identifiers: *Monongahela River Basin(MD PA WV).

This study of the Monongahela River Basin in MD, PA and WV gives a procedure for developing rankings of environmental problems. A central idea is that although pollution abatement aims at improving environmental quality, it is also a project to help stimulate the local economy. There are several basic objectives: abatement project investments should support economic development; projects are selected on the basis of contribution toward designated standards; and strategies and fund allocation must be viewed to ensure general environmental improvement at a given site; investment must be selective in order to achieve the most at the least cost; investment will be made where more rather than fewer people are affected, the economy is stronger, growth is anticipated, and where public investments are ongoing; and laws must be recognized. Because pollution is concentrated in some areas and not others, the region was divided into pollution abatement zones which are the primary units for assessing pollution and investment. After a given amount of money is assigned to a zone, priorities are given which will maximize benefits within that zone. Sub-basins and county areas were used for socio-economic analysis and administrative areas, respectively. The procedural steps are: (1) inventory information on pollution, the economy, other abatement attempts; (2) measure and assign values to pollution within pollution abatement zones, to the importance of abatement, and to the effort; (3) composite rating of pollution abatement zones and an assessment of the relative importance of illegal pollution; (4) project identification; (5) selection of projects. (Smith-North Carolina)
W76-06571

ANNUAL REPORT 1974.
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, Pa.
For primary bibliographic entry see Field 6B.
W76-06572

ENVIRONMENTAL MANAGEMENT FOR THE METROPOLITAN AREA CEDAR-GREEN RIVER BASINS, WASHINGTON, PART II: URBAN DRAINAGE.
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 6G.
W76-06573

KANEOCHE ALTERNATIVES: AN APPLICATION OF IMPACT METHODOLOGY.
Hawaii Environmental Simulation Lab., Honolulu.
For primary bibliographic entry see Field 6G.
W76-06574

SUMMARY AND CONCLUSIONS: NUTRIENT TRANSPORT AND ACCOUNTABILITY IN THE LOWER SUSQUEHANNA RIVER BASIN,
Environmental Protection Agency , Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 5B.
W76-06575

THE DISTRIBUTIONAL ECOLOGY AND DIVERSITY OF BENTHIC INSECTS IN CEMENT CREEK, COLORADO,
Maryland Univ., College Park. Md. Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W76-06587

NORTHERN GREAT PLAINS RESOURCE PROGRAM, WATER WORK GROUP REPORT.
Northern Great Plains Resources Program, Denver, Colo.
For primary bibliographic entry see Field 3E.
W76-06616

CORRECTIVE TAXES FOR POLLUTION CONTROL: AN APPLICATION OF THE ENVIRONMENTAL PRICING AND STANDARDS SYSTEMS TO AGRICULTURE,
California Univ., Santa Cruz. Dept. of Economics.
L. W. Abrams, and J. L. Barr.
Journal of Environmental Economics and Management, Vol. 1, p. 296-318, 1974. 6 fig., 11 tab., 2 ref.

Descriptors: *Pollution taxes(Charges), *Tax rates, *Fertilizers, *Efficiencies, Linear programming, Mathematical models, Nitrogen, Nitrates, Agriculture, Costs, Illinois, Water quality standards, Pollution abatement.
Identifiers: *Environmental Pricing and Standards, Point-source pollutants, Dispersed-source pollutants.

The Environmental Pricing and Standards System (EPS), a corrective tax approach to managing environmental quality which avoids the problem of constructing the social damage function by not requiring fully Pareto efficient solutions, is applied to the problem of managing surface water nitrate pollution in agricultural regions. Regression analysis is used to relate nitrogen fertilizer use to nitrate concentration found in Illinois waters. These relationships enable the regional environmental nitrate-nitrogen standards to be translated into constrants on agricultural production. A mathematical programming model translates the environmental constraints and Illinois production alternatives into the national agricultural market. Cost minimizing production patterns and optimal nitrogen application rates are determined using linear programming techniques. Nitrogen use is constrained, and the optimal shadow prices on these constraints can be interpreted as the cor-

rective taxes on nitrogen fertilizer which are necessary to achieve specific environmental standards. The effect that application of the EPS approach would have on land use, production, prices and income are examined for both Illinois farmers and the nation. Results indicate that corrective taxes of 1-2 cents per pound would be needed to achieve the U.S. Public Health Service standard of 10 ppm. (Luedtke-Wisconsin).
W76-06618

STABILITY ANALYSIS OF AN EFFLUENT CHARGE AND THE 'POLLUTERS PAY' PRINCIPLE,
Louvain Univ. (Belgium).
H. Tulkens, and F. Schoumaker.
Journal of Public Economics, Vol. 4, No. 3, p. 245-269, 1975. 4 fig., 15 ref. NSF GS-3269-A2.

Descriptors: *Pollution taxes(Charges), Optimization, Effluents, Mathematical studies, Compensation, Pollution abatement.
Identifiers: Stability analysis, Pigovian taxes, Pareto optimum, Externalities.

Problems relating to the control of a detrimental externality affecting many agents through a Pigovian tax are considered. Under conditions of a pure exchange economy with two private commodities and one collective externality, a nontatonnement process is formulated which yields a rule for adjusting an effluent charge of the Pigovian type from the zero level at a laissez-faire equilibrium up to a Pareto optimum. Convergence, monotonous decrease of the externality along a continuous path of price equilibria, and the distributional implications of alternative redistribution schemes for the proceeds of the charge are analyzed. Various interpretations of the 'polluters pay' principle are also discussed in conjunction with property rights. The stability analysis methodology developed by Dreze, de la Vallee Poussin, and Malinvaud in recent literature on the theory of public goods is utilized with two variations: (1) The quality of public good is controlled by means of a price, the Pigovian tax, instead of being directly planned, and (2) the economy always remains within feasible states, along the process. The analysis is limited to the simplest case for reasons of expositional clarity, but possible extensions of the process are also briefly discussed. (Luedtke-Wisconsin).
W76-06623

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR THE ASBESTOS INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-238 268, $5.50 in paper copy, $2.25 in microfiche. Report No. EPA-230/2-74-001, December 1974. 112 p. 19 fig., 26 tab., 27 append. 60-01-1541.

Descriptors: *Economic impact, *Water pollution control, *Mineral industry, *Asbestos, Prices, Industrial production, Employment, Foreign trade, Costs, Pollution abatement, Industrial wastes, Effluents, Legislation.
Identifiers: *Asbestos industry.

The potential economic impact of water pollution abatement requirements on the asbestos products manufacturing industry under the Federal Water Pollution Control Amendments Act of 1972 for three standards: (1) The best practicable control technology (BPT), (2) the best available control technology (BAT), and (3) the new source performance standards (NSPS), is evaluated. Broad economic effects including prices, continued viability of affected plants, employment, industry growth, and foreign trade are considered. Capital costs for the entire industry to meet the 1977 BPT standards are estimated to be $2,928,000 or less than 1.8% of the estimated annual sales of the asbestos products. This is not expected to be a major burden on the industry, though it is possible that three plants could be forced to shut down. BAT standard implementation would require a total capital expenditure of about $6,510,000, with one additional plant closing possible. Analysis of the impact of NSPS indicates that there would be no adverse effects on the growth of the industry due to the standards, that price structure and market competitiveness would not be significantly affected, and that these costs would not constitute a significant inducement for U.S. manufacturers to locate new facilities at foreign sites. (Luedtke-Wisconsin).
W76-06626

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES. THE NONFERROUS METALS INDUSTRY (ALUMINUM),
Little (Arthur D.), Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-239 161, $6.25 in paper copy, $2.25 in microfiche. Report No. EPA-230/2-74-018, August 1974. 150 p. 8 fig., 46 tab., append. 68-01-1541.

Descriptors: *Economic impact, *Water pollution control, *Mineral industry, *Aluminum, Prices, Industrial production, Employment, Foreign trade, Air pollution, Costs, Pollution abatement, Industrial wastes, Effluents, Legislation, Standards.
Identifiers: *Aluminum industry, Bauxite refining industry.

The potential economic impact of pollution abatement requirements under the Federal Water Pollution Control Amendments Act of 1972 for three standards: (1) Best practicable control technology (BPT), (2) best available control technology (BAT), and (3) new source performance standards (NSPS), is evaluated for the aluminum industry. Broad economic effects including product price increases, continued viability of affected plants, employment, industry growth and foreign trade are considered. In the primary aluminum industry, the trend toward the use of dry scrubbers for air pollution control at an annual cost of about .01
W76-06627

A GUIDE TO WISCONSIN'S LAKE MANAGEMENT LAW.
Wisconsin Univ. Extension, Madison.
For primary bibliographic entry see Field 6E.
W76-06632

LAKE MANAGEMENT CONFERENCE, MAY 12-14, 1975.
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 4A.
W76-06642

INFRARED DRY CAUSTIC VS. WET CAUSTIC PEELING OF WHITE POTATOES,
Western Potato Service, Inc., Grand Forks, N. Dak.
For primary bibliographic entry see Field 5D.
W76-06652

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES, INVESTIGATION REPORT, PHELPS DODGE CORPORATION, MORENCI TAILINGS DAM, MORENCI, ARIZONA, VOLUME 2,
Wahler (W.A.) and Associates, Palo Alto, Calif.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-243 075, $7.50 in paper copy, $2.00 in microfiche. Bureau of Mines OFR 50(2)-75, December 1974. 172 p, 25 fig, 3 tab, 16 ref, 2 append. Bu Mines S0110520.

Descriptors: *Arizona, *Embankments, *Waste disposal, *Mining, Drill holes, Geologic control, Failures, Disposal, Research facilities Seismic properties, Engineering, Piezometers, Materials testing, Sampling, Testing procedures.
Identifiers: *Tailings, *Morenci(Ariz), Disposal practices, Field density, Failure conditions.

The Phelps Dodge Corporation's tailings embankments numbers 1 West and 2 West, at Morenci, Arizona, were studied. Pertinent factors relating to the physical features and operational characteristics of the facility were described. These included information on embankment construction practices and investigation of the general geologic and seismicity characteristics of the site and vicinity. Limited field exploration and sampling of materials was made at the site. Piezometers, surface movement markers, and slope indicator casings were installed and monitored on a limited basis. In the laboratory, tests were made of materials to evaluate the basic index and engineering properties of the embankment and tailings materials. Selected engineering analyses of the embankment for various types of potential 'failure' conditions were made. The report included two very detailed appendixes. (See also W76-06670 thru W76-06672) (Roberts-ISWS)
W76-06669

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES. INVESTIGATION REPORT, KENNECOTT COPPER CORPORATION, MAGNA TAILINGS DAM, MAGNA, UTAH. VOLUME 3,
Wahler (W.A.) and Associates, Palo Alto, Calif.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-243 076, $8.00 in paper copy, $2.25 in microfiche. Bureau of Mines OFR 50(3)-75, December 1974. 226 p, 22 fig, 3 tab, 21 ref, 3 append. Bu Mines S0110520.

Descriptors: *Embankments, *Utah, *Waste disposal, *Mining, Sites, Drilling, Disposal, Research facilities, Geologic control, Failures, Seismic properties, Engineering, Piezometers, Materials testing, Sampling, Testing procedures.
Identifiers: *Tailings, *Site geology, *Magna(Utah), Disposal system, Seismicity, Refuse disposal system, Field exploration.

The results of studies of Kennecott Copper Corporation's tailings embankment at Magna, Utah were described. Stability studies were performed on only one cross section of the embankment by utilizing data obtained from drilling, sampling, and testing, which was limited in nature. Data were collected to provide background information to support the overall research effort. It was not possible to evaluate the degree of safety or adequacy of the embankment disposal system. The Magna tailings deposit is located within the Basin and Range structural and physiographic province of western United States. The formation is moderately to complexly folded, with fold axes trending approximately in a north to northeast direction. The tailings deposit lies on partially indurated lake sediments of the Great Salt Lake and of the former Lake Bonneville, which consist mostly of clay with sand and gravel. The nearest known active fault is about 12 mi east of the tailings area. The report contained a discussion of site geology and seismicity, information on the refuse disposal system, pertinent characteristics of the tailings materials, a summary of engineering analyses, and a set of references. (See also W76-06669) (Roberts-ISWS)
W76-06670

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES. RECONNAISSANCE REPORT, VOLUME 5.
Wahler (W. A.) and Associates, Palo Alto, Calif.

vailable from the National Technical Informa-
on Service, Springfield, Va. 22161 as PB-243 078,
4.50 in paper copy, $2.25 in microfiche. Bureau of
lines OFR 50(5)-75, December 1974. 55 p, 4 fig,
7 photos. Bu Mines S0110520.

escriptors: *Waste dumps, *Mining, *Waste
isposal, Copper, Iron, Lead, Zinc, Phosphates,
lining engineering, Investigations, Sampling,
rilling equipment, Soils, Drilling, Bulk density,
urveys.
lentifiers: *Mill refuse, *Mining industry, Recon-
aissance-level investigations.

econnaissance-level investigations were carried
ut to gather supplemental data to the in-depth stu-
ies of Kennecott's Magna and Phelps Dodge's
lorenci tailings deposits and Kennecott's Chino
aching dump. The data were obtained to deter-
ine to what extent the disposal systems and
echniques used at the three sites studied in depth
pify those of the mining industry, represented by
e 15 other sites. The sites visited were classified
ccording to the different systems and techniques
sed by the mining industry. The probable effects
nd relationships between site conditions and
isposal methods were determined and evaluated
the extent feasible. The visits were comprehen-
ive; the purpose was mainly to determine how
ese sites related to those for which detailed in-
estigations were accomplished in order to define
reas requiring further in-depth investigations.
he visits consisted of discussions with mining
ompany representatives (to obtain information
egarding disposal plans, design considerations
nd historical data on dam construction), followed
y inspection of the disposal structures. Aerial ob-
ervation surveys were also conducted to supple-
ent data obtained during the ground inspection
nd to obtain overall views of the sites. (See also
W76-06669) (Roberts-ISWS)
W76-06672

ETROLEUM-OXIDIZING BACTERIA FROM HE GULF OF FINLAND, (IN RUSSIAN),
ep. Moscow State Univ. (USSR). Dept. of
icrobiology.
or primary bibliographic entry see Field 5C.
W76-06788

REATMENT PLANTS FOR REMOVING HEL-MINTHS FROM SEWAGE BEFORE ITS USE N CULTIVATED PASTURES, (IN RUSSIAN),
ll-Union Scientific Research Inst. of Medical
arasitology and Tropical Diseases, Moscow
USSR).
or primary bibliographic entry see Field 5D.
W76-06795

5. WATER RESOURCES PLANNING

PA STANDARDS: HEALTH OR HEADACHE,
orth Carolina Univ., Chapel Hill. Dept. of En-
ironmental Sciences and Engineering.
or primary bibliographic entry see Field 5G.
W76-06489

5A. Techniques Of Planning

A MARGINAL COST BASIS FOR METROPOLITAN WATER SUPPLY ALLOCA-TION AND OPERATION,
Northwestern Univ., Evanston, Ill. Dept. of Civil
Engineering.
D. L. Hey.
Available from the National Technical Informa-
ion Service, Springfield, Va 22161, as PB-251 567,
7.50 in paper copy, $2.25 in microfiche. Ph.D.
Thesis, June 1974. 185 p, 17 fig, 14 tab, 49 ref, 4
ppend. OWRT B-059-ILL (5), 14-31-0001-3276.

Descriptors: *Water transfer, Regional analysis, Water demand, *Water supply, Operations, *Marginal costs, *Water distribution(Applied), Optimum development plans, Cost analysis, *Municipal water.
Identifiers: Geometric programming.

In most metropolitan areas, water is supplied to the general public through treatment plants, pumping stations, reservoirs or distribution networks. Allocation of production and transportation of these separate but adjacent supply systems is determined by the demand within a municipality. The excess capacity of one system could augment another system lacking capacity and thereby improve the use of treatment, transportation, and storage facilities of both systems. The problem is to minimize the cost of providing potable water, given a multiple-plant, regional water supply system. Optimal use of the regional systems is the main issue and not the expansion of the system. The relationships between costs of transportation, production and quantity of water were combined in an objective function that describes the variable cost of regional water supply. The transportation cost function was found to vary with the period of operation. Geometric programming was used to solve the non-linear equations describing the energy needs for transporting water. Since marginal cost analysis produces the most efficient ratio of outputs to given total demand, this knowledge can lead to better use of the existing capacity which could result in the delay or avoidance of additional capitalization. (Gemmell-Illinois)
W76-06164

A SIMULATION MODEL FOR THE MANAGEMENT OF LOW DENSITY RECREATIONAL AREAS,
State Univ. of New York at Binghamton. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-06233

THE WATERSHED APPROACH TO UNDERSTANDING OUR ENVIRONMENT,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 5G.
W76-06311

PUBLIC INVOLVEMENT IN THE CORPS OF ENGINEERS PLANNING PROCESS,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-06417

DETERMINATION OF OPTIMUM QUANTITY OF SERVICE WATER OBTAINABLE FROM ONE DAM SYSTEM,
Kyushu Inst. of Tech., Kitakyushu (Japan).
For primary bibliographic entry see Field 4A.
W76-06419

EVALUATION OF SHORT-TERM OPERATIONAL POLICIES FOR A MULTI-PURPOSE RESERVOIR SYSTEM,
Water Resources Board, Reading(England).
For primary bibliographic entry see Field 4A.
W76-06420

RELEASE CONTROL POLICY FOR A LARGE LAKE SUBJECT TO WIND WAVES,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W76-06421

CONTROL OF A RIVER SYSTEM WITH TWO STORAGE RESERVOIRS,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-06422

VIABILITY OF EXISTING WATER RESOURCE MODELS, THE POTOMAC RIVER BASIN WATER SUPPLY ALTERNATIVES,
Interstate Commission on the Potomac River Basin, Bethesda, Md.
Y. Gordon.
Journal of Hydrology, Vol. 28, No. 2/4, p 127-136, February 1976. 2 tab.

Descriptors: *River basins, *Water supply, *Alternative planning, *Potomac River, Hydrologic aspects, Topography, Water demand, Impounded waters, Groundwater, Imported water, Evaluation, Decision making, Mathematical models, District of Columbia.
Identifiers: Waste removal, Washington(DC), Estuarine water.

Considered are the topographic and hydrologic features of the Potomac River Basin, utilization of the River for water supply and waste removal, alternatives proposed for meeting future water demands (including impoundment, groundwater, estuarine water, and importation), and evaluation of the alternatives. The Potomac River Basin is often divided into upper and lower basins for water usage considerations. The most important factor in the supply of water to the Washington metropolitan area is that the greatest portion of the water is withdrawn from the actual flow of the river. Many of the factors that constrain our decision making as to the optimal solution to the water supply problem are not technical. Ecological and environmental considerations play a very important role in the choice of alternatives in any decision involving a change in existing environmental structure. Decision makers must establish a mathematical model which can include all the constraints and variables and test them. The present problem is how to define and analyze the growing concern of citizen groups and how to incorporate future discoveries into present planning. (Bell-Cornell)
W76-06424

APPLICATION OF MULTI-REGIONAL PLANNING MODELS TO THE SCHEDULING OF LARGE-SCALE WATER RESOURCE SYSTEMS DEVELOPMENT,
Geological Survey, Reston, Va.
D. W. Moody.
Journal of Hydrology (Amsterdam), Vol. 28, No. 2/4, p 101-125, February 1976. 3 fig, 2 tab, 16 equ, 14 ref.

Descriptors: *Water resources development, *Planning, *Control, *Scheduling, Water demand regions, Water supply, Projects, Constraints, Groundwater, Aquifers, Costs, *Puerto Rico, Regional development, Optimization, Mathematical models, Systems analysis, *Regional analysis.
Identifiers: *Mixed-integer programming, Cost minimization.

An important part of the water resource planning process involves the selection and scheduling of structural measures to optimize development objectives. The problem of selecting configurations of water resources projects and scheduling their construction has been discussed by a number of authors. This paper describes a water resources planning model that is also formulated as a mixed-integer program. A given geographic area is divided into planning regions within which regional water demands are assumed to be located at single points. For each planning period, the model determines the water supply projects to be built and the amount of water to be produced, treated, and imported or exported to meet future water demands at minimum present cost. Model constraints include a response function which relates groundwater withdrawals to aquifer recharge induced from stream segments forming boundaries of the aquifer. The use of this model in conjunction with

several water demand models used to evaluate the impact on nonstructural measures is also discussed in the context of water resources planning in the Commonwealth of Puerto Rico. (Bell-Cornell)
W76-06425

THE CONTROL AND OPERATION OF NUCLEAR DESALINATION SYSTEMS,
New South Wales Univ., Kensington (Australia). School of Nuclear Engineering.
For primary bibliographic entry see Field 3A.
W76-06426

RIVER BASIN DEVELOPMENT FOR SOCIO-ECONOMIC GROWTH,
National Water Authority, Budapest (Hungary). Dept. of Water Management Policy.
For primary bibliographic entry see Field 4A.
W76-06429

WATER QUALITY CONTROL SYSTEM OF ZAGYVA RIVER BASIN,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5G.
W76-06430

SYSTEMATIC APPROACHES TO ENVIRONMENTAL IMPACT ASSESSMENT: AN EVALUATION,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W76-06431

PLANNING AND SELECTING MULTIOBJECTIVE PROJECTS BY GOAL PROGRAMMING,
Wesleyan Coll. Macon, Ga.
W. P. Neely, R. M. North, and J. C. Fortson.
Water Resources Bulletin, Vol. 12, No. 1, p 19-25, February 1976. 8 ref.

Descriptors: *Water resources, *Projects, *Economics, *Planning, Evaluation, River basins, Cost-benefit analysis, Environment, Mathematical models, Systems analysis, Equations, Linear programming.
Identifiers: *Goal programming, *Multiple objectives, Integer programming, Environmental planning.

Economic and environmental quality objectives as proposed by the Water Resources Council are often conflicting. Goal programming, a variant of linear programming and integer programming is proposed as a technique for considering the multiple objectives in water resources project planning and selection. The method enables a comprehensive water resources model which considers both the economic and environmental objectives and may be implemented with data which are available to project planners. (Bell-Cornell)
W76-06432

TRANSIENT WATER QUALITY MODELING IN STREAMS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-06433

LONG-TERM OPERATION OF STORAGE HYDRO PROJECTS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-06434

FLOOD DAMAGE REDUCTION POTENTIAL OF RIVER FORECAST,
Wisconsin Univ., Green Bay. Coll. of Environmental Science.
For primary bibliographic entry see Field 6F.
W76-06435

A PRACTICAL MONTHLY OPTIMUM OPERATIONS MODEL,
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office; and Bureau of Reclamation, Sacramento, Calif. Water and Power Control Div.
For primary bibliographic entry see Field 4A.
W76-06436

DIVERSION OF WATER THROUGH NORTHFIELD MT. PUMPED STORAGE PROJECT,
Stone and Webster Engineering Corp., Boston, Mass. Water Resources Group.
For primary bibliographic entry see Field 4A.
W76-06437

WATER PLAN RANKING AND THE PUBLIC INTEREST,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-06438

WATER QUALITY PLANNING STRATEGY,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5G.
W76-06439

PLANNING WATER RESOURCES RESEARCH PROGRAMS,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W76-06440

COGNITIVE STRAWMAN: PUBLIC INPUT TO A WATER RESOURCE PLANNING SYSTEM,
Utah State Univ., Logan. Technical Committee of the Water Resources Research Centers of the Thirteen Western States.
For primary bibliographic entry see Field 6B.
W76-06548

UNCERTAINTIES IN KARSTIC WATER RESOURCES SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2F.
W76-06595

A COST ANALYSIS SYSTEM FOR PORTS,
Peruvian Port Organization, Callao.
A. Dover.
Dock and Harbour Authority, Vol. 56, No. 658, p. 118-123, 1975. 1 tab.

Descriptors: *Cost analysis, *South America, *Harbors, Ships, Management, Income, Tariff, Indirect costs, Direct costs, Facilities, Operating costs, Systems analysis, Equipment, Depreciation.
Identifiers: *Callao(Peru).

The accounting system used in the Port of Callao, Peru, based on costs per vessel, is described. The principal export cargoes are minerals and fishmeal; the imports are general break-bulk cargoes as well as bulk grain and petroleum products. The system used is based on the job control method used in the civil engineering industry and applied to evaluation of costs per vessel instead of costs per unit weight or volume of cargo. Cost analyses were computerized of direct operational, direct administrative, general administrative, infrastructure, main office, and reserve and investment fund costs. System flow charts are prepared to obtain stevedoring costs per vessel, tonnages loaded and discharged per vessel per month, tonnages received and dispatched by shed and open storage area per month, unit rates, quay labor, and revenue obtained for each vessel. Unit hourly rates are derived for handling equipment by establishing optimum life for each equipment category; annual equipment depreciation plus annual repairs and maintenance were determined and spread over total hours worked annually. Handling rates on a tonnage basis were established for each shed or open storage area on the basis of total cost for each reception and dispatch area divided by tonnages handled. (Buchanan-Davidson--Wisconsin)
W76-06631

FIBONACCI SEARCH FOR HIGH-YIELD WELL SITES,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-06686

6B. Evaluation Process

KANSAS GROUNDWATER POLICY SEMINAR,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 4B.
W76-06154

SOCIOECONOMIC ANALYSIS OF A MAJOR REHABILITATION OF IRRIGATION AND WATER MANAGEMENT SYSTEMS IN EASTERN IDAHO,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-06161

FORMULATION AND USE OF PRACTICAL MODELS FOR RIVER QUALITY ASSESSMENT,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 5G.
W76-06209

AN EVALUATION OF COST-BENEFIT ANALYSIS CRITERIA,
Leeds Univ. (Scotland). Inst. for Transport Studies.
C. Nash, D. Pearce, and J. Stanley.
Scottish Journal of Political Economy, Vol. XXII, No. 2, p. 122-134, 1975. 31 ref.

Descriptors: *Cost-benefit analysis, *Measurement, *Ethics, Social aspects, Decision making, Evaluation, Equitable apportionment.

Certain premises in the field of cost-benefit analysis are questioned in order to show that the choice between them can only be made on moral rather than logical grounds. An attempt is made to clarify the moral notions underlying existing cost-benefit procedures, which are then related to specific ethical values. Although the logic of some of the arguments used to justify particular procedures are questioned, ultimately each procedure can be related to some set of moral notions, and thus the choice between methods is in the end an ethical one, based on value judgments. It is implied that cost-benefit analysis will be most useful if results are presented in a disaggregated format, such as that of Lichfield's Planning Balance Sheet (Lichfield 1968) with incidence of effects and methods of valuation clearly stated, which can then be adjusted to conform to specific equity no

ions, and thus reach an informed opinion of the esirability of the scheme. One of the difficulties he cost-benefit analysts face is an apparent in-ompatibility of their work with growing demands or public participation in planning. Often, cost-enefit analyses have been used to justify to the ublic decisions already taken, rather than to in-orm the public of the consequences of alternative ourses of action. (Auen-Wisconsin)
/76-06227

HE EVALUATION OF BENEFITS FROM ECREATIONAL PROJECTS,
Iull Univ. (England). Dept. of Economics.
. W. Vickerman.
/rban Studies, Vol. 11, No. 3, p. 277-288, 1975. 4 ib., 8 ref.

escriptors: *Recreation demand, *Benefits, Evaluation, Model studies, Elasticity of demand. lentifiers: England.

ome fundamental objections are raised to lawson's (1959) methodology for the appraisal of ecreational project benefits. The Clawson lethod uses trip length distribution functions and ombines the demand curve, identifies the eneficiaries, and evaluates benefits. However, he central problem in this approach is that the im-lied recreation demand function deals with only a ngle facility at a time. This assumes that in order o make a prediction for a new site the situation oncerning an existing site can be transferred rough time and space; no reference is made to he supply prices of substitutes. The 'product' efinition can best be done by reference to the lasticity of substitution. The suggested model ould first identify the effects of a new facility on ecreation to define the relevant area of analysis. he likely degree of substitution between activi-es must also be allowed for, and should involve he construction of indices to express revision in ecreation habits in the form of spatial potential. It hould also be considered that development of a ew site or recreation facility may indirectly enefit other sites by inducing substitution of an ctivity and growth in total demand while trans-ort improvements and other independent in-uences on mobility enable a wider varietY of tes to be visited. (Auen-Wisconsin)
/76-06229

CONOMIC BENEFITS OF POTABLE WATER UPPLIES IN RURAL AREAS OF DEVELOP-NG COUNTRIES,
ent State Univ., Ohio. Dept of Economics.
. J. Saunders.
ournal American Water Works Association, Vol. 7, No. 6, p 314-317, 1975. 23 ref.

escriptors: *Foreign countries, *Rural areas, Water supply, *Benefits, Economic impact, So-al impact, Income distribution, Financing.
lentifiers: *Underdeveloped countries.

he problems of measuring benefits of potable ater supplies to rural villages in underdeveloped ountries are discussed. The concept that a pota-le water supply for villages of a developing ountry is necessary for economic growth is falli-le because the potable water supply alone is not fficient to stimulate economic development, ir-spective of any improved health benefits. If the ater supply system is designed to provide water r livestock, irrigation of small gardens, and is mplemented by health education, sanitation, eder roads, and marketing information the robability exists that a water supply program will ave an economic impact. The major administra-ve problems associated with providing piped ater to rural villages are due to the lack of incen-ve and expertise for operation and maintenance the systems. Factors that increase the potential successful performance of the administration nd financial aspects of such programs are con-ibutions of labor and money to help cover con-structions costs, user fees that at least cover operation and maintenance expenses, and that rural water supply programs are controlled by a national or regional agency. Investment in a water supply system in rural areas in Third World countries will generally result in income redistribution from higher-income urban to lower-income rural areas and urban slums. (Auen-Wisconsin).
W76-06230

SOME PROBLEMS IN ESTIMATING THE DEMAND FOR OUTDOOR RECREATION,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 6D.
W76-06232

A SIMULATION MODEL FOR THE MANAGEMENT OF LOW DENSITY RECREATIONAL AREAS,
State Univ. of New York at Binghamton. Dept. of Economics.
V. K. Smith, and J. V. Krutilla.
Journal of Environmental Economics and Management, Vol. 1, No. 3, p. 187-201, 1974. 1 fig., 7 tab., 11 ref., 1 append. FS Int-19-03(10).

Descriptors: *National recreation areas, *Carrying capacity, *Public lands, *Model studies, *Density, National parks, Management, Use rates, Attitudes, Behavior, Montana.
Identifiers: *Congestion, Wilderness recreation, Wildland areas, Primitive areas, Spanish Peaks(Mont).

The economic concept of 'carrying capacity', defined in terms of the maximum level of output of a constant quality available from a given resource, is the norm for measuring the attributes of primitive recreation areas in terms of solitude enjoyed during an outing. Solitude is defined as a recreation activity with members of a group of their choosing; intrusion upon solitude refers to interaction with others outside the group. The number and types of encounters with other parties were found to be useful proxies for the disruption of solitude and, as such, erode the quality of the recreation experience (i.e., impose congestion costs). These were used as criteria for a large scale simulation model to estimate these effects for a wilderness area. The model is parameterized to correspond to the 1970 recreational season conditions in the Spanish Peaks Primitive Area in Montana. In order to take account of the congestion externalities associated with increased use intensity during a given period, the model determines the effects of alternative use levels on the expected quality of each individual's experience. The simulation experiments were designed to examine the effects of total use and pattern of use on measured encounters as a guide to management decisions. (Auen-Wisconsin).
W76-06233

A FRAMEWORK FOR EVALUATING INSTITUTIONAL AND SOCIO-ECONOMIC ISSUES OF LAND TREATMENT OF WASTE WATER,
Economic Research Service, Upper Darby, Pa. Natural Resource Economics Div.
For primary bibliographic entry see Field 5G.
W76-06320

THE DEVELOPING ROLE OF WATER AUTHORITIES,
South West Water Authority (England). Exeter Div.
G. D. Slade.
Chartered Municipal Engineer, Vol. 102, No. 11, p 211-215, November, 1975. 3 fig, 6 ref.

Descriptors: *Administration, *Water resources development, Comprehensive planning, Regional planning.
Identifiers: *Water authorities(G.B.)

Population increases, food production increase demands, industrial relocation, increased housing demands, more recreation, redistribution of wealth, and better communications all exert pressures on the newly-established Water Authorities in Great Britain to provide more water, main drainage, land drainage, and water-space amenities. The interplay between national, regional, and local resources is complicated. Already the regional Water Authorities must evaluate themselves and their relations with national and local contacts. Broader national policies and more cooperation between regions must be accepted. A composite management/structure type committee to assess the reorganized system and the two Royal Commission reports is recommended. In the development of the Water Authorities, important guidelines for future policies can be established. (Loustau-FIRL)
W76-06322

PUBLIC INVOLVEMENT IN THE CORPS OF ENGINEERS PLANNING PROCESS,
Institute for Water Resources (Army), Fort Belvoir, Va.
J. R. Hanchey.
IWR Research Report 75-R4, October 1975. 44 p, 49 ref, append.

Descriptors: *Water resources, *Planning, *Public participation, Management, Design, Decision making, Budgeting, Communication.
Identifiers: Public information programs.

This report discusses the design, implementation, and management of public involvement programs as integral parts of the Corps of Engineers water resources planning process. The approach to program development suggested relies on several key concepts: (1) planning should be viewed as consisting of several sequential stages, each of which has a definable output and therefore represents an implicit or explicit decision point; (2) public involvement programs can and should be approached on a stage-by-stage basis; (3) there should be public checkpoints at the end of each stage to provide the public and the reviewing elements of the Corps with citizen input as to the adequacy and responsiveness of the planning to date; (4) these public checkpoints are not in themselves adequate, but are only the culmination of active participation during each planning stage by limited segments of the public; and (5) decision making responsive to public concerns requires the explicit consideration of public input before key decisions are made at each state. The report includes chapters on developing public involvement programs, forums for obtaining citizen input, guidelines for developing public information programs, monitoring and evaluation of programs, and staff organization and budgeting for public involvement activities. (Bell-Cornell)
W76-06417

A STUDY TO ASSESS GOALS FOR USES AND MANAGEMENT OF SHORELINE AND IMPLICATIONS FOR CORPS OF ENGINEERS PROGRAMS.
Coastal Zone Resources Corp. Wilmington, N. C.
IWR Contract Report 75-4, U. S. Army Corps of Engineers, Institute for Water Resources, Fort Belvoir, Virginia, July 1975. 101 p, 4 fig, 3 tab, 49 ref. DACW-31-75-C-0017

Descriptors: *Coasts, *Management, *Assessment, Shore protection, Legislation, Governments, Beach erosion, Control, Programs.
Identifiers: *Coastal zone management.

A high level of activity relating to use and management of shorelines and the coastal zone is in evidence. This study is an assessment of the significance of legislation, policies and actions affecting the coastal zone at all levels of government. The assessed activities are interpreted for their significance to Corps of Engineer programs in

shore protection. The study concludes that the state assert their authority for the coastal zone management function and the Federal agencies should help identify and perform activities complimentary to state programs. Further, the Corps is advised to formulize its technical support relationships with State Coastal Zone agencies, develop and prepare educational materials to assist in coastal zone problems, expand research in coastal problems and explain remote sensing technology. (Bell-Cornell)
W76-06418

VIABILITY OF EXISTING WATER RESOURCE MODELS, THE POTOMAC RIVER BASIN WATER SUPPLY ALTERNATIVES,
Interstate Commission on the Potomac River Basin, Bethesda, Md.
For primary bibliographic entry see Field 6A.
W76-06424

COOPERATIVE MANAGEMENT AND DEVELOPMENT OF INTERNATIONAL RIVER BASINS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-06428

RIVER BASIN DEVELOPMENT FOR SOCIO-ECONOMIC GROWTH,
National Water Authority, Budapest (Hungary). Dept. of Water Management Policy.
For primary bibliographic entry see Field 4A.
W76-06429

PLANNING AND SELECTING MULTIOBJECTIVE PROJECTS BY GOAL PROGRAMMING,
Wesleyan Coll. Macon, Ga.
For primary bibliographic entry see Field 6A.
W76-06432

WATER PLAN RANKING AND THE PUBLIC INTEREST,
Stanford Univ., Calif. Dept. of Civil Engineering.
L. Ortolano.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Proceedings paper No. 12068. Vol. 102, No. WR1, p 35-48, April, 1976. 2 fig, 25 ref.

Descriptors: *Water resoures, *Planning, *Environmental effects, *Social participation, Economic efficiency, Equations, Water law.
Identifiers: Multiple objectives, Weighted sum of objectives technique, Weighted sum of factors technique, Federal laws.

The 'public interest,' which often serves as the basis for ranking alternative Federal water resources plans, is defined in terms of the following: What factors should be considered and how should the factors be weighed relative to one another in ranking proposals. Answers to these questions provide the framework for an analysis of several approaches that have been used in ranking alternatives (e.g., economic efficiency, weighted sum of objectives). In the course of examining these approaches, an argument is made in support of trends toward the direct involvement of citizens in the determination of factors and weights. The approaches examined, as they are commonly employed in practice, are shown to be less than satisfactory in terms of involving citizens in determining factors and weights. A process is outlined which integrates public involvement activities into the ranking of alternatives and which has been found useful in the context of Corps of Engineers' water resources studies. (Bell-Cornell)
W76-06438

PLANNING WATER RESOURCES RESEARCH PROGRAMS,
Idaho Univ., Moscow. Water Resources Research Inst.
J. S. Gladwell.
Journal of the Water Resources Planning and Management Division, Vol. 102, No. WR1, Proceedings of the American Society of Civil Engineers, Proceedings paper No. 12072, p 3-10, April 1976.

Descriptors: *Research and Development, *Technology, *Assessment, *Water resources, *Priorities, Benefits, Creativity, Management, Planning, Economics, Social aspects, Projects, Research priorities.
Identifiers: Applied research, Basic research, Information systems, Quality.

Development of a plan for a water research program is no simple task. The manager must resolve a number of problems which, although not unique, are complicated because of the nature of the scientific enterprise. Among the problems are the balance between basic and applied research, criteria for project selection, difficulties of crash programs, staffing, establishing priorities, and control of duplication of efforts. An effective program must plan not only for the actual research effort, but must include consideration for dissemination and implementation of the results. This means that practitioners must be included in the continuing planning effort. Furthermore, the interaction between practitioners and scientists will assist in insuring that the results will be in a form that will be useable. The researchers should then be used by the funding organization to be sure that the results are understood and properly implemented. (Bell-Cornell)
W76-06440

WISCONSIN PUBLIC PARTICIPATION PROCEDURES.
For primary bibliographic entry see Field 6E.
W76-06500

COGNITIVE STRAWMAN: PUBLIC INPUT TO A WATER RESOURCE PLANNING SYSTEM,
Utah State Univ., Logan. Technical Committee of the Water Resources Research Centers of the Thirteen Western States.
R. M. Judge, P. B. Kimball, and W. W. Wilson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 751, $8.00 in paper copy, $2.25 in microfiche. Research Report, (1975). 217 p, 31 fig, 20 tab, 97 ref, 3 append. Edited by R. Gum. OWRT C-4330 (9049) (2) 14-31-0001-9049

Descriptors: *Water quality, *Decision making, Information exchange, *Evaluation, Surveys, *Social values, *Planning, Arizona, New Mexico, Psychological aspects, Rio Grande River, Attitudes, *Social needs.
Identifiers: *Multiple-objective planning, *Strawman project, *Rio Grande Valley(N Mex), *Information systems.

The purpose is to develop an information system to input public values into the planning and evaluation process. A hierarchy of goals is developed and disaggregated until terms meaningful to the general public and describing the state of the world can be input to the disaggregation. The disaggregation of community goals may provide a means of linking the technical criteria of the professional and the values and goals of the general public. Conventional scaling techniques of ranking and rating are discussed and compared with a general allocation technique and other psychological scaling methods to estimate the parameters of a function for quantifying perceived satisfaction. The general allocation technique, used in a mail survey, shows promise as a means of recovering community preferences. A power function is tested against the satisfaction ratings given to samples of water of varying clarity. The general allocation technique was used to recover the parameters of the quantifying function. It was then applied to determine the goal and sub-goal preferences of subjects in Arizona and the Rio Grande Valley of New Mexico. (See also W76-01110)
W76-06548

REORIENTATION OF URBAN WATER RESOURCES RESEARCH, FINAL REPORT,
Rutger-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple, Jr., M. M. Hufschmidt, B. B. Berger, D. H. Howells, and L.D. James.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 907 $4.50 in paper copy, $2.25 in microfiche. Proceedings of a Workshop, published by Water Resources Research Institute, Rutgers University, February 1976, 52 p. OWRT B-062-NJ(1) 14-31-0001-5134

Descriptors: *Water quality control, Management, *Institutions, *Research priorities, *Cities, *Urbanization, *Research and development, Urban runoff, Land management, Water quality, Technology, *Urban hydrology, Flood plains.
Identifiers: *Research policy, *Urban-related water resources research, *Water-land interfaces, Urban water quality, Urban flood plain management.

This is a report of a workshop held at Quail Roost, N.C. and of final conclusions by editing and steering committee, to develop an improved program of water resources research related primarily to problems in urban and urbanizing areas. The workshop participants were widely representative of different disciplines, different regions, and of agencies and professional consultants as well as the academic community. The consensus was that the Federal approach to water resources has generally neglected the problems of metropolitan areas. Hydrological, water quality and ecological data are insufficient, technology to meet many problems is lacking, and existing institutions are ill adapted to the problems now being encountered. Particular emphasis in urban-related research needs to be given to fields of water quality, flood plain management, and interfaces with land-use planning and control. Strategies and basic objectives should be re-examined as well as the problems of planning to meet environmental objectives at reasonable cost. Programs of urban-related water resources research are recommended.
W76-06553

REORIENTATION OF URBAN WATER RESOURCES RESEARCH, EXECUTIVE SUMMARY,
Rutger-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple, Jr., M. M. Hufschmidt,, B. B. Berger,, L. D. James, and B. B. Howells.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-251 908, $3,50 in paper copy, $2.25 in microfiche. Proceedings of a Workshop, published by Water Resources Research Institute, Rutgers University, March 1976, 15 p. OWRT-B-062-NJ(1). 14-31-0001-5134

Descriptors: *Water quality control, Management, *Institutions, *Research priorities, *Cities, *Urbanization, *Research and development, Urban runoff, Land management, Water quality, Technology, *Urban hydrology, Flood plains.
Identifiers: *Research policy, *Urban-related water resources research, *Water-land interfaces, Urban water quality, Urban flood plain management.

This is an abbreviated report of the findings of a workshop sponsored by the Universities Council on Water Resources and the Urban Water Resources Research Council of the American

Society of Civil Engineers, and held at Quail Roost, N.C. in July 1975. Recommendations for urban-related research related to water quality propose development of strategy and methodology to contribute to remedying the various deficiences, including those in the basic planning goals and approaches, better methods of measuring and evaluating pollution from urban runoff, methods of determining the environmental effects of pollution, alternative water quality enhancement approaches (other than effluent treatment), and a better institutional framework for areawide planning. There is no unified national policy for flood plain management. Goals of economic efficiency, of avoidance of social disruption, of financial aid after a disaster, and of better land use of flood plains are expressed implicitly in various Federal programs; but they need analysis and interpretation in relevant and consistent terms. Much state legislation needs modernization to keep pace with new developments.
W76-06554

INVENTORY OF FLORIDA COASTAL ZONE PLANNING PUBLICATIONS: VOLUME I, COASTAL COUNTIES AND CITIES.
Florida Dept. of Nautral Resources, Tallahassee. Bureau of Coastal Zone Planning.
For primary bibliographic entry see Field 2L.
W76-06566

INVENTORY OF FLORIDA COASTAL ZONE PLANNING PUBLICATIONS: VOLUME II, MULTI-COUNTY PLANNING DISTRICTS.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Coastal Zone Planning.
For primary bibliographic entry see Field 2L.
W76-06567

INVENTORY OF FLORIDA COASTAL ZONE PLANNING PUBLICATIONS: VOLUME III, STATEWIDE.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Coastal Zone Planning.
For primary bibliographic entry see Field 2L.
W76-06568

DEVELOPMENT OF A PRIORITY DETERMINATION PROCEDURE.
Rivkin/Carson, Inc., Washington, D.C.; and Edwards (Arthur) Associates, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06571

ANNUAL REPORT 1974.
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, Pa.
September 1975. 27 p, 10 fig, 3 tab.

Descriptors: *Regional development, *Planning, Regions, Local governments, *Environmental effects, *Water supply, *Sewage treatment, Recreation, Employment, Storm damage, *Pennsylvania.
Identifiers: Lehigh County(PA), Northampton County(PA), Housing, Policy analysis, Citizen participation.

This report covers major issues and policies of important areas: regional growth, human resources and community service, housing, recreation, environmental protection and transportation. In response to citizen questions the introduction discusses why planning takes so much time and why it may seem that plans are not implemented. It is argued that plans are being implemented but over a long period and that plans must change periodically to reflect new conditions. In 1974 the Joint Planning Commission completed the draft of the Regional Storm Drainage Plan which documents existing problems, analyzes future trends and recommends solutions for problems in individual drainage basins throughout the region. Procedures for planning of private and public water systems were examined. A study of the public water systems in the western part of the county was initiated. Major problems exist regarding future sewage treatment plan capacity. Allentown needs to expand the plant at Kline's Island and has applied for federal funding. Construction of a sewer interceptor relief line in the western part of the county is needed. Water quality in some portions of the region is too poor to provide a safe water supply or support aquatic life. Lehigh County needs to develop a long range water supply. Proliferation of private water companies may hinder development of a regional water supply plan because it may not be economically feasible to serve fragmented leftover areas with public water. Public sewers need to be extended in urbanizing areas since developers continue to pressure for building of packaged treatment plants beyond present sewer extensions. (Smith - North Carolina)
W76-06572

NORTHERN GREAT PLAINS RESOURCE PROGRAM, WATER WORK GROUP REPORT.
Northern Great Plains Resources Program, Denver, Colo.
For primary bibliographic entry see Field 3E.
W76-06616

A NOTE ON UNCERTAINTY AND THE EVALUATION OF PUBLIC INVESTMENT DECISIONS,
State Univ. of New York at Stony Brook. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W76-06617

PARETO OPTIMALITY, PURE PUBLIC GOODS, IMPURE PUBLIC GOODS AND MULTIREGIONAL SPILLOVERS,
Arizona State Univ., Tempe.
T. Sandler.
Scottish Journal of Political Economy, Vol. 22, No. 1, p. 25-38, 1975. 2 fig., 26 ref.

Descriptors: *Economic efficiency, *Governmental interrelations, *Welfare(Economics), Benefits, Optimization, Governments, Mathematical models, Planning.
Identifiers: *Public goods, *Pareto optimality, International cooperation, Spillovers, Multiregional, Interregional, Congestion.

Factors involved in multiregion or multicountry sharing of public goods exemplified by common market arrangements, military alliances and congestion are examined, with particular attention to the issues of an economic theory of optimal group size when impure public goods are shared between regions, and trade-offs among interregional public goods. First, the recent literature, particularly that on impure public goods and on optimal provision of public goods by local governments, is integrated in order to derive the efficiency conditions in a number of diverse situations. Pareto-optimal ratios are stated for a number of cases, including: (a) that in which any number of participating regions and multiple public goods are producing interregional spillovers of benefits, (b) the situation in which a good is impurely public both within and between regions due to congestion costs. User fees and their role in financing an optimal quantity of the public good are also discussed. Secondly, an analysis of the behavioral assumption regarding cooperation indicates that the independent adjustment equilibrium and the Pareto-optimal equilibrium serve as bounds to the cooperative equilibrium. (Luedtke-Wisconsin).
W76-06620

EXTERNALITIES AND COASE THEOREM: A GRAPHICAL ANALYSIS,
For primary bibliographic entry see Field 6C.
W76-06621

LAKE LOCATION AND QUALITY AS DETERMINANTS OF POTENTIAL RECREATION BENEFITS: A STUDY OF SELECTED LAKES IN MANITOBA,
Manitoba Univ., Winnipeg, Dept. of Agricultural Economics and Farm Management.
R. E. Capel, and C. B. Ross.
In: Proceedings Symposium on the Lakes of Western Canada, June 1973, Water Resources Center and the Dept. of Extension, Univ. of Alberta, Edmonton, p. 114-144. 1 fig., 12 tab., 28 ref., 3 append.

Descriptors: *Sites, *Recreation demand, *Use rates, *Benefits, *Forecasting, Lakes, *Canada, Regional development, Model studies, Estimating, Recreation facilities, Competing uses, Indicators, Data collections, Aesthetics, Regression analysis, Alternate planning, Decision making.
Identifiers: *Manitoba, Recreation quality indices.

A method is proposed to help lake developers choose the plan which will provide maximum benefits. Recreational demand is considered regionally, rather than individually for each lake development project. A model developed to describe visitation by city residents to recreation areas, considers population, site location and quality, and competition between sites. Visitation patterns of Winnipeg and southwest Manitoba residents were studied. Recreational area quality indices based on presence of beaches, fishing, docks, and ramps were determined for 61 areas with various water resource qualities. The model indicated that number of visitor days spent in a recreation area per year by town residents per capita of that town's population was a function of distance from town to area and of the recreational area quality index. Data was obtained by mail questionnaires and park gate traffic counts. The model can project visitation to actual or hypothetical parks. Using travel cost techniques, demand curves can project benefits for benefit cost analysis of alternative plans. It provides a framework for planning and study of development proposals, and indicates future research needs. Lake quality indices, relationships between adjacent areas, and effects of number of recreational areas on total visitation are variables to be considered. (Buchanan-Davidson--Wisconsin).
W76-06622

COST-BENEFIT RULES IN GENERAL EQUILIBRIUM,
Queen's Univ., Kingston (Ontario).
R. W. Broadway.
Review of Economic Studies, Vol. 67 (3), No. 131, p. 361-374, 1975. 1 fig., 17 ref.

Descriptors: *Economic efficiency, *Model studies, *Government finance, Cost-benefit analysis, Taxes, Cost allocation, Mathematical models, Welfare(Economics), Prices, Marginal costs.
Identifiers: Shadow prices.

The question of what rules the government should use to evaluate efficiency gains from public sector projects in a tax-distorted economy is considered. A simple general equilibrium model is employed to illustrate relationships among a variety of propositions which have appeared in the recent literature on applied welfare economics. Three cases are examined in some detail: (1) The Hotelling-Harberger-Lesourne proposition that in order to measure welfare changes due to government policy changes such as taxes, it is necessary to look at changes induced in the allocation of all goods and factors which are sold at distorted prices, (2) the Harberger proposition that when the government undertakes a project which directly involves the use of goods or factors purchased or sold on distorted markets, it ought to account for the distortions by using a shadow price or weighted average of the demand and supply prices for the good or factor, and (3) the Diamond-Mirrlees proposition that under certain conditions, when the government sets all taxes optimally, it should

use private sector producer prices as shadow prices in the public sector in order to achieve overall production efficiency in the economy. A more general cost-benefit rule which incorporates these special cases is also developed. (Luedtke-Wisconsin).
W76-06625

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR THE ASBESTOS INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-06626

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES. THE NONFERROUS METALS INDUSTRY (ALUMINUM),
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-06627

WISCONSIN RECREATIONAL HARBOR FACILITIES ALONG LAKE MICHIGAN,
Wisconsin Univ., Parkside, Dept. of Earth Science.
L. C. Ruedisili.
Report August 1974. 45 p.

Descriptors: *Lake Michigan, *Recreation facilities, *Boating, Harbors, Docks, *Wisconsin, Marinas, Surveys, Maintenance costs.

Thirty-six small craft marinas and yacht clubs located along the western shore of Lake Michigan in Wisconsin were surveyed in detail. The facilities were located between the Wisconsin-Michigan border on the north and the Wisconsin-Illinois border to the south. Although the survey is not complete, it is believed to include all of the major facilities available to recreational boaters on Lake Michigan. The name, address, phone number and manager or commodore of each facility is listed. The services which are available to the recreational boater at each facility are shown, including gasoline and oil, telephone, water, electricity, ice and supplies, restroom facilities, shower facilities, dock attendant, marine repairs, haul-out facilities, U.S. Coast Guard, launching ramp, holding tank pump-out, UHF-FM marine radio and mooring accomodations. Comments describe the design and management of each facility and estimated annual maintenance costs of each facility. (Buchanan-Davidson--Wisconsin).
W76-06628

A SOCIO-ECONOMIC EVALUATION OF ALTERNATIVE WATER MANAGEMENT POLICIES ON THE RIO GRANDE IN NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
R. R. Landsford, S. Ben-David, and T. G. Gebhard, Jr.
Natural Resources Jour, Vol. 15 p. 307-325 (1975). 19 p, 1 fig, 4 tab, 14 ref. OWRT A-045-NMEX(8).

Descriptors: *Surface waters, *Rio Grande River, *New Mexico, *Groundwater, *Economic impact, Regulation, Economic prediction, Econometrics, Planning, Productivity, Industrial production, Employment, Human resources, Statistical models, Statistical methods, Linear programming, Optimization, Water resources, Water supply, Water utilization, Water law, Riparian waters, Irrigation, Farming, Water rights.

Three alternative water management policies have been proposed for the Rio Grande river. They are: (1) no water constraint; (2) surface-water constraint; and (3) both surface water and groundwater constraints. A socio-economic model was developed to project future water use patterns and economic development under the alternative assumptions. This model was essentially a linear programming model designed to represent the New Mexico economy with special emphasis on the Rio Grande region. The model showed that without a water constraint, both regional production and water depletion were expected to exhibit the largest increase. When a surface water constraint was added the value of production decreased significantly. This decrease was even greater when both surface water and groundwater constraints were added. The added constraints, however, also drastically reduced water depletion. Such reduced depltion would be necessary for the region to support anticipated population increases in the twenty-first century. (Nursey-Florida)
W76-06644

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ENERGY AND POLLUTION CONCERNS IN DREDGING,
Army Engineer Div. South Atlantic, Atlanta, Ga.
For primary bibliographic entry see Field 5C.
W76-06183

THE ROLE OF POLLUTEE TAXES IN EXTERNALITY PROBLEMS,
Boston Coll., Chestnut Hill, Mass.
For primary bibliographic entry see Field 5G.
W76-06226

THE POLITICAL ECONOMY OF EFFLUENT CHARGES,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 5G.
W76-06228

COSTS IN RELATION TO CHARGES AT UK COMMON-USER BERTHS,
Deep Water Terminal Ltd. (England).
A. B. Reid, and H. K. Dally.
Dock and Harbour Authority, Vol. 56, No. 658, p. 127-130, 1975. 1 fig., 5 tab., 2 ref.

Descriptors: *Harbors, *Costs, *Transportation, Facilities, Cost analysis, Europe, Operating costs, Fixed costs, Unit costs, Inflation(Economic), Port authorities.
Identifiers: *England, Common-user Berths, Container berths, Docks.

Current container-handling charges of deep-sea container berths at major United Kingdom and North European ports are examined. The annual operating cost is composed of fixed (quay works, dredging, and a proportion of infrastructure and common assets) and variable (handling equipment, maintenance, dock labor, and power) costs. There must be a basic minimum of equipment, maintenance, and manning in order to provide satisfactory service. Because the basic fixed costs of operating a container berth are high, the unit cost per container handling is highly sensitive to annual throughput. Inflation has greatly affected costs. Costs should not be so high they discourage potential clients or so low it would be difficult to break even. Present British charges do not even cover operation costs and there has been a marked reduction in general cargo handling revenue. British ports are undercharging each container they handle at common-user berths from 14.50-29 pounds sterling, so that an average berth which commenced operation in 1972 would lose about 800,000 pounds in 1975. European ports generally charge more. It is concluded that higher British handling charges would not alter their competitive position with European ports. Ports should reflect the real cost of operating container berths in their charges. (Buchanan-Davidson--Wisconsin).
W76-06234

PRE-INVESTMENT IN PORT FACILITIES,
Liverpool Univ. (England). Marine Transport Centre.
M. Whittington.
Dock and Harbour Authority, Vol. 56, No. 658, p. 131-134, 1975.

Descriptors: *Investment, *Economics, *Harbors, Engineering structures, Costs, Construction costs, Transportation, Ships, Economic feasibility, Facilities.
Identifiers: *Port facilities.

Relationships between port sector engineering costs and marine sector costs are considered so that investment decisions can be based on the entire transport picture. Cost components of bulk transport systems are ships time, port, inventory, and inland transport costs. With bulk liquid transport (such as oil) time in port and cost of suitable berths are not important factors, but the cost and availability of water of sufficient depth and area are primary constraints on vessel size. With dry bulk vessels, length of time in port increases with vessel size, and infrastructure cost rather than cost of the berth determines the optimum facility size. With conventional and containerized general cargo, costs per ton of cargo for berth are small compared to other port costs (labor and marine sector costs). Costs of providing water, space, and communications are most important in determining economic feasibilities of new port facilities. Suitable water depths determine bulk cargo project sizes, while handling speeds are important for general cargo systems. Water depths and back-up areas are important for containerized general cargo. Costs of providing port infrastructure (inland transport facilities and sheltered water of sufficient depth) are generally more important than costs associated with increased depth and berth load bearing strength. (Buchanan-Davidson--Wisconsin).
W76-06236

AN ECONOMIC STUDY OF THE UNOX AND CONVENTIONAL AERATION SYSTEMS,
For primary bibliographic entry see Field 5D.
W76-06288

COMPUTERIZED MONTHLY REPORTS, COST-EFFECTIVE ALTERNATIVE,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W76-06300

MONOGRAPH FOR THE EFFECTIVENESS AND COST OF WATER TREATMENT PROCESSES FOR THE REMOVAL OF SPECIFIC CONTAMINATS, VOLUME II, KWIK INDEX,
Volkert (David) and Associates, Bethesda, Md.
For primary bibliographic entry see Field 5F.
W76-06350

CASE STUDY: FOR THE ANALYSIS OF WATER MANAGEMENT INVESTMENTS ON HAND OF THE EXAMPLE OF THE KISKORE RIVER BARRAGE AND ITS IRRIGATION SYSTEMS,
For primary bibliographic entry see Field 4A.
W76-06427

A STANDARDIZED PROCEDURE FOR ESTIMATING COSTS OF SALINE WATER CONVERSION.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 3A.
W76-06550

COSTS ARE SOARING: IRRIGATING FROM THE UNDERGROUND,
Arizona Univ. Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-06586

THE ECONOMICS OF CONVERTING NATURAL GAS-POWERED IRRIGATION PUMPS TO ALTERNATE ENERGY SOURCES IN SOUTHEASTERN ARIZONA,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-06588

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING 'AS LOW AS PRACTICABLE' GUIDES--APPENDIX A. PREPARATION OF COST ESTIMATES FOR VOLUME 1, MILLING OF URANIUM ORES,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5D.
W76-06614

ESTIMATING INDIRECT COST OF URBAN WATER USE,
Koebig and Koebig, Inc., Los Angeles, Calif.
C. H. Lawrence.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 101, No. EE 4, p. 517-533, 1975. 3 fig., 4 tab., 21 ref.

Descriptors: *Impaired water quality, *Water users, *Indirect costs, *Municipal water, California, Hardness(Water), Dissolved solids, Corrosion, Damages, Water works, Equipment, Industrial water, Water softening, Economic impact, Estimated costs, Mineral water.
Identifiers: Southern California.

Correlated composites of earlier quality related cost effects studies are presented in graph form as a means of approximating the economic impact of water mineral quality on urban water consumers. Specifically, indirect costs of urban water use are estimated for the Los Angeles River Basin 4B. Water mineral quality is reflected by total dissolved solids (TDS), and the impact of water hardness on the deterioration of domestic plumbing, domestic water heaters, municipal water works equipment, industrial water treatment and all domestic and commercial measures taken to contend with total hardness, are quantified. Total impact cost curves are developed for a complete range of dissolved solids and hardness. Unit costs are presented on an overall municipal basis. The slope of the total impact cost curve, i.e., the penalty cost, is expressed in dollars/acre-foot per mg/l TDS. For the 1974 conditions believed to prevail within the highly urbanized coastal plain area of Basin 4B, the penalty cost was estimated to range between about $25/acre foot (2.0 cents/ cu m) per 100 mg/l TDS at the low TDS range and about $35/acre ft (2.8 cents/cu m) per 100 mg/l TDS at the high TDS range. (Slattery-Wisconsin)
W76-06615

NORTHERN GREAT PLAINS RESOURCE PROGRAM, WATER WORK GROUP REPORT.
Northern Great Plains Resources Program, Denver, Colo.
For primary bibliographic entry see Field 3E.
W76-06616

A NOTE ON UNCERTAINTY AND THE EVALUATION OF PUBLIC INVESTMENT DECISIONS,
State Univ. of New York at Stony Brook. Dept. of Economics.
E. James.
American Economic Review, Vol. 65, No. 1, p. 200-205, 1975. 3 fig., 4 ref.

Descriptors: *Risks, *Project feasibility, Government finance, Investment, Decision making, Dispersion, Economies of scale.
Identifiers: Scale effect, Dispersion effect.

The controversy over the optimal handling of risk by the government between those who advocate that the government should base its decisions on prices prevailing in the market and those who argue that the appropriate social risk premium is lower than the private is considered. Whether government investment projects should be evaluated individually or as a group is examined in the context of this controversy. The Arrow-Lind argument for a low social risk premium arises from a scale effect, while the risk pooling argument arises from a dispersion effect. It is shown that the effect on dispersion of risk pooling may lead the government to accept a group of projects which were individually rejected, while the scale effect may lead the government to reject a group of projects which were accepted individually. Thus the risk spreading, scale effect, should dominate in the evaluation of individual projects and the risk pooling, dispersion effect, should dominate in the group evaluation. This theme is developed using diagrammatic techniques. The necessary and sufficient assumptions for the Arrow-Lind finding that if the time-state preference approach is used, the value of an investment to the individual depends only on its expected return, are also investigated. (Luedtke-Wisconsin).
W76-06617

CORRECTIVE TAXES FOR POLLUTION CONTROL: AN APPLICATION OF THE ENVIRONMENTAL PRICING AND STANDARDS SYSTEMS TO AGRICULTURE,
California Univ., Santa Cruz. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-06618

PARETO OPTIMALITY, PURE PUBLIC GOODS, IMPURE PUBLIC GOODS AND MULTIREGIONAL SPILLOVERS,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 6B.
W76-06620

EXTERNALITIES AND COASE THEOREM: A GRAPHICAL ANALYSIS,
A. Gifford.
Quarterly Review of Economics and Business, Vol. 14, No. 4, p. 7-21, 1974. 11 fig., 12 ref.

Descriptors: *Resource allocation, *Industrial production, *Optimization, Damages, Compensation, Indirect costs, Marginal costs, Taxes.
Identifiers: *Externalities, *Coase theorem, Pigovian taxation, Nonconvexities, Transaction costs, Property rights.

A graphical analysis, which reaffirms the validity of the Coase theorem by demonstrating that differing assignments of property rights in externality situations do not lead to different resource allocations or to a breakdown in the optimal property of competition when transaction costs are zero, is developed. Allocation of rights distributes initial wealth, but has no effect on the final, socially optimal outcome. The graphic technique is also used to show that if a Pigovian tax is imposed to correct an externality situation where transaction costs are sufficiently low, the firms will be induced to bargain away from the socially optimal level of output which the taxation was originally designed to produce. The impact of taxing on resource allocation in the presence of low transaction costs is the opposite of that caused by the initial externality. Finally, it is demonstrated that problems arising from nonconvexities in the firms' cost or profit functions will not cause the resource allocation efficiency part of the Coase theorem to break down. (Luedtke-Wisconsin).
W76-06621

STABILITY ANALYSIS OF AN EFFLUENT CHARGE AND THE 'POLLUTERS PAY' PRINCIPLE,
Louvain Univ. (Belgium).
For primary bibliographic entry see Field 5G.
W76-06623

AN ECONOMIC ANALYSIS OF GEORGIA'S MARINE CHARTER BOAT FISHING INDUSTRY,
Georgia Univ., Athens. Dept. of Agricultural Economics.
E. E. Brown, and F. J. Holemo.
Marine Fisheries Review, Vol. 37, No. 4, p. 11-12, 1975. 2 tab., 7 ref.

Descriptors: *Recreation, *Marine fisheries, *Return(Monetary), *Sport fishing, Boats, *Georgia, Economic impact, Indirect benefits.
Identifiers: *Charter boats, Party boats.

Based on the economic impact of the charter boat fishing industry in California, it is projected that this industry has growth potential in Georgia. A comparison of California's sport and commercial fishing industries indicates that sport fishing contributes more to California's economy than commercial fishing, i.e., $100-$200 million for sport fishing as opposed to $45 million for commercial fishing. The secondary income effects of sport fishing, between $300-$400 million, exceed the $200-$300 million generated by commercial fishing. The food value of marine fish caught by sport fishermen is estimated to be nearly two-thirds of the commercial catch. The amount of money spent in marine recreational fishing is far in excess of the dollar value of the fish caught. The current average income of charter boat operators in Georgia is $5108 annually, but the three most profitable charter boat operators expect yearly average net returns to total $26,374. Fifteen of the 17 Georgia operators did not rely upon the charter income for their entire living. The break-even costs, based on 812 charter hours, were $17 per hour, but this cost is reduced with increased hours of operation; the most profitable operators averaged 1241 hours annually resulting in a break-even cost of $11 per hour. (Auen-Wisconsin).
W76-06624

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR THE ASBESTOS INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-06626

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES. THE NONFERROUS METALS INDUSTRY (ALUMINUM),
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-06627

WISCONSIN RECREATIONAL HARBOR FACILITIES ALONG LAKE MICHIGAN,
Wisconsin Univ., Parkside, Dept. of Earth Science.
For primary bibliographic entry see Field 6B.
W76-06628

RATES MUST BE FAIR,
Black, Crow and Eidsness, Gainesville, Fla.
J. D. MacGregor.
Water and Wastes Engineering, Vol. 12, No. 5, p. 31-34, 1975. 1 fig., 8 tab.

Descriptors: *Water rates, *Equity, *Water costs, *Utilities, Cost allocation, Water utilization, *Florida.

Rate structures must develop sufficient revenues to provide for operation, maintenance, and capital investment and at the same time must distribute cost equitably to all customers in relation to the benefits they derive or expenses they cause. The base extra-capacity rate determination method divides total cost (operating and capital) into costs which vary with amount of water produced, number of customers served, and water consumption rate. Extra-capacity costs are subdivided into costs of providing maximum day and maximum hour requirements. Block meter systems afford a lower unit cost for increased consumption and related costs to total consumption, but not to rate of water consumption. A rate structure method used in Florida is presented. Customers are classified as residential, apartments, or commercial and a peak consumption ratio determined and use for the determining peak hour costs. Contributions of each new customer type to operating and capital expenses are adjusted for expanded plant capacity. A deposit of connection fee funds could offset bond parity requirements, earn the cost of capital, and supply the difference between the per thousand gallon capital cost requirement during bond indenture. This plan reflects equitable cost distribution but requires careful cash flow management. (Buchanan-Davidson--Wisconsin).
W76-06629

METER REPLACEMENT PROGRAM PAYS FOR ITSELF,
Mankato Water and Sanitation Dept., Minn.
W. V. Lacina.
Water and Sewage Works, Vol. 121, No. 11, p. 73-76, 1974.

Descriptors: *Water works, *Instrumentation, Domestic water, *Minnesota, Automation, Replacement costs, Maintenance costs, Cost-benefit analysis.
Identifiers: Mankato(Minn), Remote registers.

Because customer billings for water consumption accounted for only 68% of water actually pumped, the City of Mankato, Minnesota, decided to replace all 6700 residential meters in its distribution system. Analysis showed that it would cost about $70,000 more to modernize and repair existing equipment than to replace all meters with new plastic Recordall meters and Read-o-Matic outdoor registers. In 1972 mechanical drive units were replaced with plastic meters and outdoor registers installed. Benefits were multiplied because sewer user fees are based on metered consumption of water. Water revenue increases after meter modernization amounted to $272,351 for 1972-1973. Total outlay was $204,077, leaving a $68,000 surplus. Since meter replacement costs were shared by the water and sanitation sections, the surplus was approximately $170,000. Remote outdoor registers have eliminated meter reading delays. It is anticipated that in time the meters can be read by signals transmitted to a central computer over telephone lines; field trials are in progress to evaluate the feasibility of this approach. (Buchanan-Davidson--Wisconsin).
W76-06630

A COST ANALYSIS SYSTEM FOR PORTS,
Peruvian Port Organization, Callao.
For primary bibliographic entry see Field 6A.
W76-06631

THE INFLUENCE OF FLOOD HAZARDS UPON RESIDENTIAL PROPERTY VALUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6F.
W76-06643

6D. Water Demand

A MARGINAL COST BASIS FOR METROPOLITAN WATER SUPPLY ALLOCATION AND OPERATION,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W76-06164

SOME PROBLEMS IN ESTIMATING THE DEMAND FOR OUTDOOR RECREATION,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
K. E. McConnell.
American Journal of Agricultural Economics, Vol. 57, No. 2, p. 330-334, 1975. 9 ref.

Descriptors: *Recreation demand, *Evaluation, Econometrics, Measurement, Income, Travel time, Time, Use rates.

Outdoor recreation demand functions are used to make inferences about the consumers' surplus and the social welfare derived from particular sites. Therefore empirical research should be as consistent as is feasible with the theoretical structure from which the consumers' surplus is derived. Practical difficulties implied by the assumptions of utility maximization are shown. The econometric structure of a demand model must be specified so that the price coefficient may vary as income varies, thus permitting analysts to determine which demand functions are not consistent with utility maximization. An analysis of the demand for outdoor recreation in a utility maximization framework in order to analyze empirical issues of research in outdoor recreation economics is developed. The value of total time consumed by the recreation activity rather than just the time in transit is the appropriate time variable in the demand for outdoor recreation. The trip or visit, not user-days, is the unit of measurement consistent with the travel cost method. There is a priori reason to specify the demand function so that the price slope can change as income changes. (Buchanan-Davidson--Wisconsin).
W76-06232

INSTITUTIONAL RATIONING OF CANAL WATER IN NORTHERN INDIA: CONFLICT BETWEEN TRADITIONAL PATTERNS AND MODERN NEEDS,
California Univ., Davis. Dept. of Agricultural Economics; and California Univ., Davis. Dept. of Water Science and Engineering.
R. B. Reidinger.
Economic Development and Cultural Change, Vol. 23, No. 1, p. 79-104, 1974. 2 fig., 5 tab., 25 ref.

Descriptors: *Irrigation canals, *Rationing(Water), *Water allocation(Policy), Channels, Reservoirs, Water supply, Farm units, Water users, Water utilization, Irrigation programs, Equitable apportionment, Irrigation systems.
Identifiers: *India, Bhakra canals(India).

Examination of the water rationing system used in the Hissar district of the Bhakra canals in north India showed that water rationing occurs at three levels: water available in the reservoir; rotation among channels; and at the farm with rotation of turns among farmers served by the same watercourse. Institutional or administrative decision rules and schedules rather than market forces govern canal-water rationing. Rationing at the various levels and the relative water scarcity cause uncertainty in the farmers' water supply and may explain the poor performance of many canal irrigation projects with respect to yields, profits, and use of irrigation potential. Competition between electricity and irrigation and interaction between canal and farm rotations are the primary causes of uncertain water supplies. The nonmarket nature of the rationing system and its lack of flexibility and controllability preclude compensating adjustments. To meet the needs of modern agriculture and to increase the predictability, certainty, and control of canal-water supply, capacity factors should be more closely matched to crop water needs. More equal sharing of water between small farmers and increase in supply predictability is needed. A water users' association to determine distribution is a possible method for providing more flexibility and control in farm-water supply. (Buchanan-Davidson--Wisconsin).
W76-06235

THE FUTURE OF WATER RESOURCES,
Wessex Water Authority, Bristol (England).
For primary bibliographic entry see Field 5F.
W76-06324

HIDDEN WATERS IN ARID LANDS.
For primary bibliographic entry see Field 4B.
W76-06585

LAKE LOCATION AND QUALITY AS DETERMINANTS OF POTENTIAL RECREATION BENEFITS: A STUDY OF SELECTED LAKES IN MANITOBA,
Manitoba Univ., Winnipeg, Dept. of Agricultural Economics and Farm Management.
For primary bibliographic entry see Field 6B.
W76-06622

6E. Water Law and Institutions

ECONOMIC AND LEGAL ANALYSIS OF ALTERNATIVE FLOOD CONTROL STRATEGIES: PHASE I,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6F.
W76-06159

PROCEEDINGS OF CONFERENCE ON 'PERSPECTIVES ON FORMULATING STATE WATER POLICY'.
Minnesota Univ., Minneapolis. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-251 578 $4.50 in paper copy, $2.25 in microfiche. WRRC Bulletin No. 85, December 1975. 51 p. OWRT A-999-MINN(39).

Descriptors: *Minnesota, *Water policy, Planning, Conferences, Water management(Applied), *State government, Research priorities, Legal aspects, Water law, Water rights, Legislation, Jurisdiction.

The program of the Conference consisted of presentations by representatives of the Legislative, Executive, and Judicial Branches of government in Minnesota. The emphasis was on the role of the three branches of government in forming and carrying out water policy, and/or the specific water policy needs in Minnesota. (Waelti-Minnesota)
W76-06160

IMPLEMENTATION OF INTERSTATE WATER QUALITY PLAN,
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 5G.
W76-06201

THE POLITICAL ECONOMY OF EFFLUENT CHARGES,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 5G.
W76-06228

ECONOMIC BENEFITS OF POTABLE WATER SUPPLIES IN RURAL AREAS OF DEVELOPING COUNTRIES,
Kent State Univ., Ohio. Dept of Economics.
For primary bibliographic entry see Field 6B.
W76-06230

INSTITUTIONAL RATIONING OF CANAL WATER IN NORTHERN INDIA: CONFLICT BETWEEN TRADITIONAL PATTERNS AND MODERN NEEDS,
California Univ., Davis. Dept. of Agricultural Economics; and California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 6D.
W76-06235

THE DEVELOPING ROLE OF WATER AUTHORITIES,
South West Water Authority (England). Exeter Div.
For primary bibliographic entry see Field 6B.
W76-06322

WATER QUALITY MANAGEMENT FOR METROPOLITAN KANSAS CITY,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5G.
W76-06323

DEALING WITH THE DISCHARGE MONITORING REPORT,
San Antonio Wastewater Treatment Plant, Tex.
For primary bibliographic entry see Field 5G.
W76-06325

HOW THE GREAT LAKES WERE EVALUATED,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 5G.
W76-06329

CANADA WATER ACT - ANNUAL REPORT, 1973-74,
Department of the Environment, Ottawa (Ontario).
(1974), 30 p. English and French versions.

Descriptors: *Canada, *Water law, *Legislation, *Water management, *Water quality control, Federal government, Nutrients, Planning, Costs, Sewage, Sediments, Fisheries, Effluents, Phosphates, International Joint Commission, Flood control.
Identifiers: *Federal - provincial agreements(Canada), *Canada Water Act.

The objectives and activities under the Canada Water Act are described. The main provisions of the Act are outlined and some of the more important programs are briefly discussed. Details of various federal - provincial agreements and cooperative arrangements are also provided along with information on a program to regulate nutrient releases. Various data systems and management arrangements established or information are briefly noted and data collections are summarized. (Environment Canada)
W76-06369

THE NATURE AND EXTENT OF RIGHTS IN WATER IN NORTH DAKOTA,
R. E. Beck, and J. C. Hart.
North Dakota Law Review, Vol. 51, No. 2, p. 249-314 (1974). 66 p, 335 ref. OWRT A-035-NDAK(2).

Descriptors: *North Dakota, *Water rights, *Water law, Prescriptive rights, Prior appropriation, Relative rights, Riparian rights, Governments, Judicial decisions, Legislation, Public rights, Legal aspects, Competing uses, Federal-State water rights conflicts, Jurisdiction, Regulation, Riparian waters, Usufructuary right, Governmental interrelations.

This article discusses in depth the competing ownership and control interests in the water within North Dakota. The North Dakota Code states that ownership of the water within North Dakota is in the public. The authors state, however, that this provision can only be interpreted in light of the following considerations: private riparian and prescriptive rights and rights of appropriation under North Dakota statutes; ownership rights which may exist in the Federal government and Indian tribes; federal control over the use of water; Canadian claims to international streams; claims of other states to interstate bodies of water. The article also points out problems related to each of the claims analyzed. The authors state that many of these problems could be resolved through rule making by the State Engineer or the State Water Commission, and if they fail to act, by the North Dakota Legislature. The authors also offer suggestions to aid in the resolution of many conflicting problems. (Nursey-Florida)
W76-06378

A STUDY TO ASSESS GOALS FOR USES AND MANAGEMENT OF SHORELINE AND IMPLICATIONS FOR CORPS OF ENGINEERS PROGRAMS.
Coastal Zone Resources Corp. Wilmington, N. C.
For primary bibliographic entry see Field 6B.
W76-06418

CONTROL OF ABSTRACTION BY LAW,
F. C. C. Hodges.
Journal of Hydrology, Vol. 28, No. 2/4, p 137-153, February 1976. 6 ref.

Descriptors: *Water resources development, *Conservation, *Water law, *Water rights, Water utilization, Control, Surface waters, Aquifers, Riparian rights, Rivers, Flow, Irrigation, Water pollution.
Identifiers: Water abstraction.

The conservation and development of water resources involves control by law of any abstraction of water. The law of a country relating to its water rights must play a major part where development is concerned, particularly in arid and semiarid countries. This paper considers various facets of major water use in general terms and considers ancillary problems connected with those abstractions, with some views and recommendations as to possible methods to be considered and actions to be taken to control legally these varying uses. Discussed are systems of laws relating to both abstraction from surfaced sources and underground aquifers (including Common Law, appropriation, combined Common Law - Riparian/Appropriation, full state ownership, and state ownership combined with minor private ownership), comparison between systems, definition of constituents of a water source in respect of water rights, underground sources, and interrelationship between underground aquifer-surface flow. Considered also are ownership of land married to a water source, determination of water rights, irrigation and development areas, over-extractionanticipatory legislation, registration and licencing, water pollution, leakage to potable sources, and land fragmentation and porposed consolidation schemes. (Bell-Cornell)
W76-06423

CASE STUDY: FOR THE ANALYSIS OF WATER MANAGEMENT INVESTMENTS ON HAND OF THE EXAMPLE OF THE KISKORE RIVER BARRAGE AND ITS IRRIGATION SYSTEMS,
For primary bibliographic entry see Field 4A.
W76-06427

COOPERATIVE MANAGEMENT AND DEVELOPMENT OF INTERNATIONAL RIVER BASINS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-06428

WATER QUALITY PLANNING STRATEGY,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5G.
W76-06439

DECISIONS FOR DELAWARE: SEA GRANT LOOKS AT LEGAL ASPECTS OF OCS DEVELOPMENT,
Delaware Univ., Newark. Center for the Study of Marine Policy.
G. J. Mangone, and J. Homer.
Decisions for Delaware, Marine Advisory Services, University of Delaware Sea Grant Program (Oct. 1975). 25 p, 1 map, 4 photo, 3 dwg, 2 chart.

Descriptors: *Delaware, *Continental shelf, *Ownership of beds, *Harbors, *Oceans, Beds, Waste disposal, Federal jurisdiction, Oil, Natural gas, Natural resources, Environmental effects, Permits, Water pollution control, Public health, Penalties(Legal), Legislation.
Identifiers: *Deep water ports, *Deepwater Port Act.

Recent legislation and litigation has had a significant impact on the uses of the United States outer continental shelf (OCS) including the exploration of petroleum, the development of deep water ports, and the use of the shelf as a dumping site. Because of a Supreme Court ruling that the United States has title to the ocean seabed outside of three miles from shore, the Department of the Interior will start leasing offshore lands for oil and gas development. While these leases are considered critical in spurring domestic development, several potential problems are foreseen concerning unrealistic production goals, the elimination of competition, and environmental concerns. Problems are also foreseen concerning the construction of deepwater ports authorized by the Deepwater Port Act of 1974. Many of these problems, however, have been allayed by provisions allowing the imposition of severe penalties for oil spills and other violations of the act. Penalties may also be imposed for violation of the Marine Protection, Research and Sanctuaries Act of 1972 which sets up a permit system to regulate the dumping of specified materials in the ocean. (Hoffman-Florida)
W76-06485

WATER RESOURCES DEVELOPMENT OF INTERNATIONAL RIVERS WITH SPECIAL REFERENCE TO THE DEVELOPING WORLD,
West Indies Univ., Barbados. School of Law.
For primary bibliographic entry see Field 4A.
W76-06486

THE EFFICIENT USE OF UTAH'S IRRIGATION WATER: INCREASED TRANSFERABILITY OF WATER RIGHTS,
Utah Univ., Salt Lake City. Coll. of Law.
For primary bibliographic entry see Field 3F.
W76-06487

THE COMMON LAW OF PUBLIC NUISANCE IN STATE ENVIRONMENTAL LITIGATION,
K. S. Boger.
Environmental Affairs, Vol. 4 p.367-392 (1975). 26 p, 124 ref.

Descriptors: *Public rights, *Pollution abatement, *Penalties(Legal), *State governments, *Common law, Legal aspects, Judicial decisions, Law enforcement, Legislation, Water pollution, Air pollu-

tion, Pollutants, Water pollution control, Water quality, Water quality control, Water law, Water pollution effects.
Identifiers: *Injunctive relief, *Nuisance(Legal aspects), Standing(Legal).

A public nuisance action brought by the State can be an effective means to control private pollution when statutory and administrative remedies are inadequate and obstacles to its use such as preemption, primary jurisdiction and legislative authorization are overcome. If a State's environmental legislation contains no provision in derogation of the common law, then it seems reasonable to suppose that common law rights of action survive. Furthermore, unless the polluting activity is explicitly authorized by legislation, a public nuisance action against the offending activity should be permitted. In contrast, despite the availability of the public nuisance action, a private action to enjoin a public nuisance before it occurs has yet to be accepted by any jurisdiction without adherence to traditionally strict standing requirements. (Nursey-Florida)
W76-06488

JAPAN AND THE UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA,
Johns Hopkins Univ., Washington, D.C., School for International Studies.
L. Wells, II.
Ocean Development and International Law, Vol. 2 p. 65-91 (1974). 27 p, 76 ref.

Descriptors: *Foreign countries, *United Nations, *International law, *Law of the sea, *Natural resources, Governments, Foreign waters, Legal aspects, Water law, Treaties, Foreign trade, Fishing, International waters, Commercial fishing, Economics, Mineral industry, Mining, Ownership of beds, Oil, Water resources, Navigable waters.
Identifiers: *Japan, *United Nations Conference on the Law of the Sea, Coastal waters.

Japan's dependence on the sea will have marked effects on Japan's position at the United Nations Conference on the Law of the Sea. Due to its lack of natural resources and the importance of its foreign trade, Japan is more dependent on the seas than any other major nation. Japanese interests have been well served to date by the existing law of the sea and Japan doubtless will press for re-affirmation of freedom of the seas as a fundamental principle at the UN Conference. However, despite this dependence, Japan has maintained a flexible stance on most major issues, avoiding the extreme stands taken by many other States. This flexibility will reduce the likelihood of having to make multiple concessions in exchange for the retention of are cardinal point. The author concludes that due to Japan's favorable relations with Third World and resource-rich countries, Japan should emerge from the Conference with its vested interests mostly intact. (Nursey-Florida)
W76-06491

FLOOD PLAIN AND TSUNAMI INUNDATION AREA ORDINANCE.
For primary bibliographic entry see Field 6F.
W76-06492

POLLUTION--RIGHT OF SHIPOWNER TO CONTRIBUTION FROM UNITED STATES WHERE NEGLIGENCE OF COAST GUARD WAS A CAUSE OF CASUALTY AND ENSUING SPILL. BURGESS V. THE TAMANO, 373 F SUPP 839 (D ME 1974),
For primary bibliographic entry see Field 5G.
W76-06493

SAMPLE SUBDIVISION CONTROL ORDINANCE FOR FLOOD HAZARD AREAS.
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 6F.
W76-06494

NEBRASKA NPDES PERMIT REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-06495

NEVADA WATER POLLUTION CONTROL LAWS.
For primary bibliographic entry see Field 5G.
W76-06496

OREGON WATER QUALITY CONTROL REGULATIONS.
Oregon Dept. of Environmental Quality, Salem.
For primary bibliographic entry see Field 5G.
W76-06497

WISCONSIN WATER POLLUTION CONTROL LAWS.
For primary bibliographic entry see Field 5G.
W76-06498

WISCONSIN DISCHARGE PERMITS REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-06499

WISCONSIN PUBLIC PARTICIPATION PROCEDURES.
In: 1974 BNA Environmental Rep. 951:0581-85 (Wisc. Ad. Code, Ch. NR3, 1974). 5 p.

Descriptors: *Permits, *Administrative decisions, *Wisconsin, *Decision making, *Comprehensive planning, Administration, Coordination, Management, Planning, Scheduling, Timing, Legislation, Adoption of practices, State governments, Public rights.
Identifiers: Public hearings, *Public participation.

To insure that interested persons are given the opportunity to make applicable comments, the Secretary of the Wisconsin Department of Natural Resources is required to issue public notice of the receipt of a completed permit application. The content and circulation requirements of this notice are set forth. To allow interested persons to make an oral statement, procedures are also set forth concerning the holding of a public hearing. If the request for such a hearing is made by the Environmental Protection Agency, any state effected by the discharge, or by a petition signed by 5 or more persons, the holding of a public hearing will be mandatory. In all other cases, the holding of a hearing shall be at the discretion of the Department. If a public hearing is held, appropriate notice shall be given. The regulations also set forth reiquirements pertaining to the location of the hearing, persons entitled to participate in the hearings, the conduct and transcripts of the hearing, and requests for changes in time or place of hearing. (Hoffman-Florida)
W76-06500

WISCONSIN WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 5G.
W76-06501

OREGON SYNTHETIC CLEANSING AGENT ACT,
In: 1972 BNA Environmental Rep. 886:0151 (Ore. Synthetic Cleansing Agent Act, 1971).

Descriptors: *Detergents, *Oregon, *Phosphorous, *Decomposing organic matter, *Waste treatment, Penalties(Legal), Biological treatment, Legislation, State governments, Administrative decisions, Environmental effects, Discharge(Water), Standards, Regulation, Water quality control.
Identifiers: *Synthetic cleansing agents.

The Oregon Synthetic Cleansing Agent Act provides that, unless a synthetic cleansing agent will degrade in a secondary sewage treatment plant, or can be decomposed into simple materials by biological means, it may not be sold in the state. Any cleansing agents sold in the state must meet applicable labeling requirements of the Department of Environmental Control. In addition, the label must contain the percentage of phosphorous by weight and the equivalency in grams of phosphorous per recommended use level. Violation of these provisions is a misdemeanor. (Hoffman-Florida)
W76-06502

UTAH WATER QUALITY STANDARDS,
For primary bibliographic entry see Field 5G.
W76-06503

WASHINGTON WATER POLLUTION CONTROL LAWS,
For primary bibliographic entry see Field 5G.
W76-06504

WASHINGTON ENVIRONMENTAL COORDINATION PROCEDURES ACT OF 1973,
In: 1974 BNA Environmental Rep 941: 0141-45 (Ch 185, Laws 1973). 5 p.

Descriptors: *Washington, *Administrative agencies, *Permits, *Coordination, *Adoption of practices, Projects, Legislation, Management, Administration, Comprehensive planning, Control, Planning, Scheduling, Decision making, State governments.
Identifiers: *Public hearings.

To assist persons who are required to obtain a number of permits before undertaking projects that will effect water resources, the state of Washington has created a mechanism that will coordinate the decision making of all interested administrative agencies. Under this mechanism, a person may file one master application to the department of ecology seeking the issuance of all permits necessary for the project. When the department receives this application, it will advise state agencies who might have permit requirements concerning the project. If notified agencies do not express an interest within a specified time, they will be barred thereafter from requiring permits for the applicant's project. If any agencies affirmatively respond, the department will forward to the applicant all necessary forms which must be completed. Upon the return receipt of these forms, the department shall give public notice of the proposed project and shall allow 30 days for the receipt of public comments. Whether a public hearing will be required before any final decision is made will depend on attendant circumstances. After all participating agencies have sent their final decision to the department, the department shall incorporate them into one document which will be transmitted to the applicant. (Hoffman-Florida)
W76-06505

WASHINGTON DEPARTMENT OF ECOLOGY ORGANIZATION,
In: 1973 BNA Environmental Rep. 941:0501-02 (Wash Ad Code, Ch. 173-02, 173-06). 2 p.

Descriptors: *Washington, *Administrative agencies, *Comprehensive planning, *Ecology, *Administration, Organizations, Management, Economics, Planning, Operations, Environmental effects, Water resources development, Law enforcement, Operations research, Scheduling, Monitoring, Technology, Research and development.

The purpose of these regulations is to assist interested persons in dealing with the department of ecology by describing its organization and

methods. The department is divided into two branches: the public services branch, which consists of the office of technical services and the office of operations; and the administration and planning branch, which consists of the office of administration and the office of planning and program development. The office of technical services is responsible for coordinating local pollution control activities and for providing laboratory services and technical assistance. The office of operations is primarily responsible for the regulatory, financing and enforcement responsibilities pertaining to pollution control activities. Duties pertaining to fiscal and administrative functions, such as records control and public information services, are the responsibility of the office of administration. Finally, the office of program planning and development is responsible for making environmental impact reviews of major projects and for developing planning standards and criteria. Apart from these specialized duties, the department of ecology shall be responsible for the protection, improvement and maintenance of the state's water resources. (Hoffman-Florida)
W76-06506

WASHINGTON WASTE WORKS REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-06507

WASHINGTON WATER POLLUTION CONTROL PLANNING REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-06508

WASHINGTON HEARINGS REGULATIONS.
In: 1975 BNA Environmental Rep 94:0741 (Wash. Ad Code, 173-225-010 through 173-225-030, 1975). 1 p.

Descriptors: *Washington, *Federal Water Pollution Control Act, *Waste water disposal, *Environmental effects, *Administrative agencies, Administration, Permits, Adoption of practices, Federal government, State governments, Administrative decisions, Water quality standards, Discharge(Water), Regulation.
Identifiers: Certification statement, Public hearings.

Pursuant to Section 401 of the Federal Water Pollution Control Act (FWPCA), all applicants seeking a federal permit pertaining to discharges into navigable waters must obtain a certification from the state in which the discharge originates. This certification should state that the discharge complies with applicable provisions of sections 301, 302, 306 and 307 of the FWPCA. Because the issuance of permits could have profound environmental effects, public notice of the application for a certification must be mailed to all interested persons and to any other person on request. If the particular application is deemed to be of a general public interest, public notice of the application must be made in a specified manner in a county newspaper of general circulation. Any member of the public may make written comments to the department of ecology within 20 days after the last public notice of the application. If the department determines that a particular application is of sufficient public interest, it may hold a public hearing, in the manner prescribed, for the submission of oral views. (Hoffman-Florida)
W76-06509

WASHINGTON NPDES PERMIT PROGRAM REGULATIONS,
For primary bibliographic entry see Field 5G.
W76-06510

WASHINGTON WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 5G.
W76-06511

WATER QUALITY STANDARDS--COLORADO RIVER SYSTEM (SALINITY CONTROL POLICY AND STANDARDS PROCEDURE).
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06512

EFFLUENT GUIDELINES -- STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06513

INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06514

FISHERY FOR KING CRAB IN ALASKA.
National Marine Fisheries Service, Washington, D. C.
40 Fed Reg 16216-17 (1975). 2 p.

Descriptors: *Crabs, *Commercial shellfish, *Alaska, *Fisheries, *Fish conservation, Programs, Management, Conservation, Protection, Resources, Wildlife, Harvesting, Permits, Labor, Capital, Investigations, Ships, Regulation.
Identifiers: *King crab.

These regulations set forth specific statistical and registration areas and requirements for registration of all king crab vessels in Alaska. In 1970 Alaska established certain area quotas for the allowable harvest of king crabs. The result was the expansion of king crab fishing into the Bering Sea, and the replacement of older wooden vessels with new steel vessels. Alaska now regulates the harvests and open seasons for United States king crab vessels fishing in the Bering Sea. There is concern that excessive numbers of vessels and gear exist in the king crab fishery, detrimentally affecting the ability of the state to manage it. The Alaska Commercial Fisheries Entry Commission has authority to limit or reduce the number of entry permits to a manageable level. It is proposed that until the Commission is able to determine the appropriate number of entry permits that should be outstanding, the king crab fishery in Alaska should be a Conditional Fishery and thus ineligible for financial assistance programs for adding vessels or gear to the fishery. (Segall-Florida)
W76-06515

TIRE AND SYNTHETIC SEGMENT OF THE RUBBER PROCESSING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06516

SOAP AND DETERGENT MANUFACTURING CATEGORY (PRETREATMENT STANDARDS FOR INCOMPATIBLE POLLUTANTS).
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06517

EFFLUENT GUIDELINES AND STANDARDS - FERROALLOYS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06518

FERROALLOY MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06519

EFFLUENT LIMITATIONS AND GUIDELINES - PRINTING INK FORMULATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06520

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06521

INTERIM PRIMARY DRINKING WATER STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06522

NAT. RES. DEF. COUNCIL V. TRAIN. (FEDERAL WATER POLLUTION ACT AMENDMENTS).
396 F Supp 1393-1402 (D.D.C. 1975). 10 p.

Descriptors: *United States, *Judicial decisions, *Federal Water Pollution Control Act, *Permits, *Effluents, Legal aspects, Water law, Judicial decisions, Federal government, Organizations, Regulation, Wastes, Water pollution sources, Water pollution control, Water pollution abatement, Water quality, Water quality control, Industrial wastes.
Identifiers: *FWPCA Amendments of 1972, Effluent limitations.

Plaintiff environmental group brought an action against defendant Administrator of the Environmental Protection Agency (EPA) for declaratory judgement concerning the power of defendant to exempt certain point sources from the permit requirements under the Federal Water Pollution Control Act. Plaintiff contended that under the regulations embodied in the Act, all point sources must obtain permits before they can discharge pollutants into navigable waters. The Act did not give the Administrator of the EPA the discretion to exempt any point sources from the permit requirements. Defendant contended that the exempted point sources were ill-suited for inclusion in a permit program and the program would operate most efficiently by defendant exercising his discretion in exempting these sources. The District Court for the District of Columbia held that under the Federal Water Pollution Control Act, all point sources were intended to be covered by the permit program. Defendant did not have discretion under the Act to exempt certain point sources from the program. (Nursey-Florida)
W76-06523

IDAHO FISH AND GAME ASS'N V. PICABO LIVESTOCK, INC. (PUBLIC'S RIGHT TO USE A NAVIGABLE STREAM).
528 P2d 1295-98 (Idaho 1974). 4 p.

Descriptors: *Public rights, *Idaho, *Judicial decisions, *Navigable waters, *Recreation, Legal aspects, Water law, State governments, Running waters, Navigation, Water sports, Riparian rights, Water utilization, Public access.

Identifiers: *Water rights(Non-riparian).

Plaintiff fish and game association brought a declaratory judgement action against defendant corporation to determine the rights of the public to the use of a creek which flowed through defendant's property. Plaintiff contended that the creek was navigable because it would float logs, and therefore, the public had the right to use the creek for recreational purposes. The Supreme Court of Idaho held that the creek was navigable in that logs over six inches in diameter could be floated on it to a place of use. The court further held that the public had the right to use the creek for all recreational purposes. (Nursey-Florida)
W76-06524

STOCK V. STATE (CONSTITUTIONALITY OF STATE ENVIRONMENTAL CONSERVATION ACT).
526 P2d 3-18 (Alas. 1974). 16 p.

Descriptors: *Alaska, *Judicial decisions, *Constitutional law, *Penalties(Legal), *Water pollution control, Legal aspects, Water law, State governments, Legislation, Water pollution, Pollutants, Water pollution sources, Water pollution abatement, Water quality, Water quality control, Sewage, Wastes.
Identifiers: Due process, *Alaska State Environmental Conservation Act.

Defendant corporation president was convicted of willfully polluting state waters in violation of the Alaska State Environmental Conservation Act. Defendant appealed on grounds that the statutory definition of the prohibited 'pollution' was unconstitutionally vague in that men of ordinary intelligence could not know which activities were proscribed. Defendant further contended that the fines of $25,000 for negligent violations and $1000 per day for willful violations constituted cruel and unusual punishment. The Supreme Court of Alaska held that although the statute may have failed to give adequate notice as to all types of conduct which were punishable, defendant's actions of dumping raw sewage into a stream running through residential areas were clearly within the outer boundaries of prohibited conduct. Therefore, the statute was not unconstitutionally vague as applied to defendant. The court further held that the fines prescribed by the statute were not so disproportionate to the offense as to be considered cruel and unusual punishment. (Nursey-Florida)
W76-06525

CAMPBELL ESTATES, INC. V. BATES (PUNITIVE DAMAGES FOR DITCH DUMPING ALL DRAINAGE ON ADJOINING PROPERTY).
517 P2d 515-23 (Ariz Ct App 1973). 9 p.

Descriptors: *Arizona, *Judicial decisions, *Drainage effects, *Adjacent land owners, *Penalties(Legal), Legal aspects, Water law, State governments, Drainage, Drainage systems, Surface drainage, Drainage water, Ditches, Surface waters, Water control, Natural flow, Alteration of flow, Relative rights.
Identifiers: Intentional torts, Punitive damages.

Plaintiff landowners brought an action against defendant adjacent landowners for damage caused by defendants' dumping drainage directly onto plaintiffs' property. Plaintiffs sought both actual and punitive damages, contending that defendants had, by use of bulldozers, created a flood channel which emptied all the floodwaters from defendants' property onto a portion of plaintiffs' property. The natural watercourse which existed before the construction of the ditch had run across defendants' property a considerable distance from the ditch. The Arizona Court of Appeals affirmed the trial courts' conclusion that the defendants had changed the natural flow of the surface water in such a manner that surface waters were collected in an artificial channel and discharged onto plaintiffs' land. The Court further held that punitive damages were justified by defendants' action in building the ditch without consulting adjacent landowners. (Nursey-Florida)
W76-06526

MYERS V. HARRIS (MUST BE CLEAR AND CONVINCING EVIDENCE THAT MEANDER LINE MEANT TO BE BOUNDARY).
519 P2d 1307-09 (Wash Ct App 1974).

Descriptors: *Washington, *Judicial decisions, *Accretion(Legal aspects), *Boundaries(Property), *Ownership of beds, Legal aspects, Water law, State governments, Pacific Ocean, Meanders, High water mark, Boundary disputes, Adjacent landowners, Shores, Water rights, Tidal waters, Bodies of water, Oceans.
Identifiers: Coastal waters, Presumptions(Legal).

Plaintiff landowners brought an action to quiet title to land formed by accretion along the Pacific Ocean. The deed which conveyed the land described one of the boundaries as the meander line of the Pacific Ocean. Defendant contended that the meander line formed the boundary of the property and, therefore, plaintiffs were not owners of any land formed by accretion subsequent to the conveyance. The Washington Court of Appeals held that under state law, a deed which uses a meander line to describe the boundaries of oceanfront property conveys the property to the water unless there is clear and convincing evidence that the grantor intended the meander line to be the actual boundary. No such evidence was found here. Thus plaintiffs had title to the accreted land between the meander line and the line of mean high tide. (Nursey-Florida)
W76-06527

TAYLOR DITCH CO. V CAREY (DAMAGE TO NEARBY PROPERTY FROM IRRIGATION DITCH SEEPAGE).
520 P2d 218-30 (Wyo. 1974).

Descriptors: *Canal seepage, *Damages, *Adjacent land owners, *Wyoming, *Judicial decisions, Legal aspects, Water law, Drainage systems, State governments, Construction, Penalties(Legal), Seepage, Canals, Conveyance structures, Leakage, Canal construction, Water conveyance, Canal design, Canal linings.
Identifiers: *Negligence, Injunctive relief, Liability(Legal).

Plaintiff landowners brought an action against defendant ditch company for damage allegedly caused to plaintiffs' property by seepage from a canal built and maintained by defendant. Plaintiffs contended that defendant was negligent in failing to maintain the canal in such a manner that water would not seep from the canal onto plaintiffs' property. The Wyoming Supreme Court held that defendant had a duty to exercise due to care in maintaining the canal and was negligent in its failure to prevent water from seeping onto plaintiffs' property. However, since there was insufficient proof that the damage to plaintiffs' property had been caused by the seepage, the court did not award money damages, but gave injunctive relief only. (Nursey-Florida)
W76-06528

STATE EX REL STATE GAM COMM'N V GOLD HILL IRR. DIST. (NO LIABILITY FOR RELEASING AQUATIC SOLVENT INTO CANALS WHICH OVERFLOWED CAUSING FISHKILL).
523 P2d 1287-91 (Ore Ct App 1974).

Descriptors: *Oregon, *Judicialdecions, *Water pollution effects, *Fishkill, *Penalties(Legal), Legal aspects, Legislation, Law enforcement, State governments, Water law, Fish, Fish conservation, Sport fish, Water pollution, Water pollution sources, Water pollution control, Pollutants, Wastes, Wildlife conservation, Path of pollutant, Bodies of water, Overflow.

Plaintiff State Game Commission brought an action against defendant irrigation district pursuant to an Oregon statute which provides for recovery of damages for the knowingly unlawful killing of game birds, animals and fish. Plaintiff alleged that defendant had intentionally released a quantity of a petroleum related product into one of its water canals and that upon the overflow of the canal, the product passed into a river killing thousands of game fish. Defendant contended that at the time it placed the solvent into the canal it was not aware that the canal would overflow causing the fishkill. The Oregon Court of Appeals held that under the statute liability attaches only if defendant commits the act knowing it will result in the unlawful killing of game animals. Since there was insufficient evidence to show that defendant knew that placing the solvent into the canal would result in the fishkill, defendant could not be held liable under the statute. (Nursey-Florida)
W76-06529

RAMADA INNS, INC. V. SALT RIVER VALLEY WATER USERS' ASS'N (NO STRICT LIABILITY FOR CANAL'S FLOODING OF HOTEL).
523 P2d 496-99 (Ariz. 1974). 4 p.

Descriptors: *Artificial watercourses, *Canals, *Arizona, *Judicial decisions, *Floodwater, Legal aspects, Water law, Penalties(Legal), State governments, Benefits, Watercourses(Legal aspects), Surface waters, Diversion structures, Levees, Running waters, Flood damage.
Identifiers: Strict liability, Public policy.

Plaintiff hotel brought an action against defendant water users' association for damage caused to the hotel by floodwaters diverted by defendant's canal. Plaintiff's complaint alleged liability based on numerous theories including a theory of strict liability. Plaintiff contended that the canal had become a dangerous instrumentality and that its owners should be subject to strict liability for reasons of public policy. Defendant argued that the canal had been in existence for so long that it should be considered to be similar to a natural watercourse. The Supreme Court of Arizona held that due to the utility and necessity of the canal, strict liability should not be imposed upon its maintenance and existence. Those landowners who chose to locate near the canal assumed the burden of loss in situations not involving the element of fault. (Nursey-Florida)
W76-06530

WERNBERG V STATE (PAYMENT OF JUST COMPENSATION FOR TAKING OF LITTORAL PROPERTY RIGHTS).
516 P2d 1191-1201 (Alaska 1973). 11 p.

Descriptors: *Littoral, *Alaska, *Judicial decisions, *Eminent domain, *Riparian rights, Legal aspects, Constitutional law, State governments, Water law, Economics, Navigable waters, Navigation, Obstruction to flow, Riparian waters, Fishing, Commercial fishing, Construction, Tidal waters, Water levels.
Identifiers: *Police power.

Plaintiff landowner brought an action in inverse condemnation against the state of Alaska and the city of Anchorage. Plaintiff alleged that defendants took a property right without just compensation, and that a highway constructed by defendants obstructed the flow of high tide waters up a creek, thereby destroying its navigability. Plaintiff had used this creek for twenty years to navigate his fishing boats to deep water for commercial fishing. Defendants contended that under the police power of the State to regulate navigable waters, the State could obstruct the flow of tide

waters without compensating plaintiff for his loss. The Supreme Court of Alaska held that under Alaska law the State may take riparian or littoral property rights for public use, but when this taking is for a use other than to aid navigation, just compensation must be paid for the taking. The court held that the plaintiff had a littoral right to the use of the creek to gain access to deep waters; consequently, the State's destruction of the navigability of the creek constituted a taking of a property right which required just compensation by the State. (Nursey-Florida)
W76-06531

PIERCE V RILEY (ACCESS TO LAKE BY NON-RIPARIAN OWNERS IMPERMISSIBLE EVEN THOUGH OVER THE LAND OF A RIPARIAN OWNER).
215 NW2d 759-62 (Mich. Ct. App. 1974). 4 p.

Descriptors: *Michigan, *Riparian land, *Riparian rights, *Reasonable use, *Easements, Legal aspects, Land use, Lakes, Water law, Real property, Channels, Access routes, Judicial decisions, Relative rights, Canals.
Identifiers: *Commercial exploitation.

Defendant riparian owners developed a tract of property which did not front on the lake. To make the development more commercially attractive, the defendants dug a canal through their riparian lot so as to provide access to the lake for a large number of non-riparian lot owners. Subsequently, the other riparian owners brought an action alleging that defendants use of their riparian property put an undue burden on the lake. After the trial court had found for defendants, plaintiffs appealed to the Court of Appeals which reversed, finding that the developers had made unreasonable use of their riparian land for the sole purpose of commercial exploitation. The case was therefore remanded to the trial court to grant plaintiffs appropriate relief. Subsequently, the trial court enjoined defendants from granting easements to the lake to any of the non-riparian lot owners, but refused to order them to fill the channel since plaintiffs had requested no such relief in their complaint. Plaintiffs once again appealed, contending that if the channel was not filled, there would be no way to enforce the court order, short of constant police vigilance. The Court of Appeals agreed and ordered that the channel be filled. (Hoffman-Florida)
W76-06532

AURICELLA V. PLANNING AND ZONING BOARD OF APPEALS (STATE PREEMPTION OF AUTHORITY OVER ALL TIDAL WETLANDS).
42 A2d 374-80 (Conn. Ct Com Pleas 1974). 7 p.

Descriptors: *Judicial decisions, *Building codes, Zoning, *Connecticut, *Wetlands, Governmental interrelations, State governments, Local governments, Water, Water law, Legal aspects, Permits, Regulation, Administrative agencies, Tidal marshes, Construction, Buildings, Coasts.
Identifiers: State policy.

Plaintiffs, vendors and purchasers of real property, were denied a building inspector's permit to construct dwellings on grounds that a special exception was required due to the location of the premises in a wetlands area. Plaintiffs appealed that decision as well, and requested a special exception from defendant planning and zoning board of appeals. The zoning board ruled against plaintiffs, basing its decision on town building zone regulations. On appeal, the Court of Common Pleas of Connecticut concluded that, by legislative mandate, tidal wetlands such as the property in question were to be regulated solely by the state. However, certain sections of the town's zoning regulations were found to be inconsistent with state tidal wetlands law. Following the rule that ordinances, subject to certain exceptions inapplicable in this case, must not conflict with state statutes, the court declared the conflicting regulations void and of no legal effect. Since plaintiffs' proposed dwellings were otherwise in conformance with the town's zoning regulations, the court ordered defendant to sustain plaintiffs' appeal from the building inspector's denial of construction permits. (Schilling-Florida)
W76-06533

DOLPHIN LANE ASS., LTD. V. SOUTHAMPTON (LOCATION OF SHORELINE PROPERTY BOUNDARY BY CUSTOMARY METHOD OF VERBAL FORMULATION).
372 NYS2d 52-55 (Ct. App. 1975). 4 p.

Descriptors: *New York, *Boundaries(Property), *High water mark, *Seashores, *Boundary disputes, Local governments, Water, Water law, Legal aspects, Judicial decisions, Bays, Beaches, Bodies of water, Shores, Coasts, Governments.
Identifiers: Coastal lands, State policy.

Plaintiff landowner brought suit against defendant town to establish the boundary line of plaintiff's shoreside property. It was undisputed that the correct boundary line of the property was the high-water line. The parties' dispute centered on the proper method by which the high-water mark should be precisely located on the land. Although evidence strongly indicated that it had previously been normal practice to locate the high-water line by reference to the line of vegetation, the trial court adopted the 'type-of-grass' test introduced by defendant. On appeal, the Court of Appeals of New York held that the application of that test was in error as a matter of law. In its decision the court concluded that no legal significance attached to any hydrographic identification of the exact line of average high water. Stressing the importance of predictability and stability in matters concerning title to real property, the court noted that the established 'line of vegetation' test could not be disregarded without altering the substance of prior conveyances. Thus the case was remanded for the purpose of determining the boundary line by reference to the line of vegetation. (Schilling-Florida)
W76-06534

CHILD V SPANISH FORK (TRANSFERENCE OF IRRIGATION WATER AS PRECEDENT TO ANNEXATION).
538 P2d 184-88 (Utah 1975). 5 p.

Descriptors: *Water transfer, *Utah, *Water rights, *Constitutional law, *Equitable apportionment, Water contracts, Legal aspects, Water law, Water supply, Judicial decisions, Legal review, Economics, Cost allocation, Contracts, Municipal water.
Identifiers: Annexation, Statutory construction.

Defendant city had entered into an agreement whereby it agreed to annex a neighboring area into the city. As part of this agreement, plaintiff landowners were required to transfer ownership of shares of local water. Because this condition was not a part of the original proposal, plaintiffs sought a declaratory judgment that the condition was invalid. Plaintiffs contended that the applicable statute allowed the city to obtain water only by means of purchase, lease or condemnation. They also contended that the city's action was arbitrary and, since present city residents did not have to transfer water rights, denied plaintiffs equal protection. Finally, they contended that the city should have made the entire city pay for the acquisition of more water. After the trial court found for the city, plaintiffs appealed to the Utah Supreme Court. The Court affirmed the decision, however, finding that the statute in question was one of authorization and not one of limitation or restriction. As to the equal protection argument, the Court found that no discrimination existed since all members of the class were treated the same. Finally, the Court found that the city was under no obligation to make all city residents pay for new water. (Hoffman-Florida)
W76-06535

LOS ANGELES V. SAN FERNANDO (PUEBLO RIGHTS TO WATER).
537 P2d 1250-1328 (Cal. 1975). 79 p, 7 append.

Descriptors: *Priorities, *California, *Preferences(Water rights), *Pueblo water rights, *Competing uses, Legal aspects, Judicial decisions, Legal review, Common law, Groundwater, Prescriptive rights, Water law, Imported water, Water demand, Water distribution, Water resources, Water supply, Water distribution, Appropriation.

Plaintiff city brought suit against defendant cities seeking to obtain a declaratory judgment as to its prior rights to water underlying the upper Los Angeles River area (ULARA). Plaintiff was also seeking to enjoin defendants from extracting water from this area unless such extraction was in subordination to plaintiff's prior rights. Following an adverse decision, plaintiff appealed to the California Supreme Court. After an extensive review of the history of pueblo water rights, the Court determined that plaintiff had such rights to all waters of the Los Angeles River needed for the reasonable use of its inhabitants. The Court went on to find that these pueblo rights extended to the ground waters of other areas besides the ULARA. However, the pueblo rights of the plaintiff did not include groundwater in basins that were independent from the Los Angeles River bed. Relying basically on this pueblo right determination, the Court also reversed the trial court on several other issues including: the right of plaintiff to sell groundwater derived from water from outside the ULARA; the prescriptive claims of the two parties; and the rights of the parties concerning imported water. Before reversing and remanding, the court went into an extensive review and analysis of existing law on all of these issues. (Hoffman-Florida)
W76-06536

BOROUGH OF MORRISVILLE V. DELAWARE RIVER BASIN COMMISSION (1958 FEDERAL WATER SUPPLY ACT, SURFACE WATER USE).
399 F Supp 469-79 (E D Pa 1975). 11 p.

Descriptors: *Equitable apportionment, *River basin commissions, *Pennsylvania, Reservoir construction, *Delaware River, Water storage, Dependable supply, Legal aspects, Judicial decisions, Water rates, Water law, Water rights, Water distribution(Applied), Constitutional law, Water users, Water utilization, Economics.
Identifiers: Pooled water doctrine, *National Environmental Policy Act, *Environmental impact statements.

In order to raise capital to construct two reservoirs, defendant River Basin Commission imposed charges for the use of the surface waters of the Delaware River. Defendants justified this rate imposition on the 'pooled water' concept, which holds that the enlargement of a river basin water supply benefits all users, regardless of whether that benefit is direct or indirect. Plaintiff municipalities rejected this premise, however, contending the Commission was required to relate any costs charged to a user for a project to the specific benefits derived by that user. Plaintiffs also based their request for injunctive relief on the contention that the Commission's actions exceeded its authority under the Delaware River Basin Compact, and violated certain federal statutes. Furthermore, the National Environmental Policy Act required the issuance of an environmental impact statement (EIS) before the adoption of the rate structure. The trial court rejected these contentions, however, and granted summary

judgment for plaintiffs after making the following findings of fact: the adoption of a rate structure did not put the Commission in the business of distributing water in violation of the compact; the water use charges did not constitute an unlawful taking since the constraints of equitable apportionment were not violated; and an EIS is required only upon a showing that an action will adversely affect the environment. (Hoffman-Florida)
W76-06537

TAYLOR V CARRICO (NO LIABILITY FOR SPILLOVER OF ARTIFICIALLY ACCUMULATED WATER WHICH IS NOT A NUISANCE).
528 SW2d 694-96 (Ky. Ct. App. 1975).

Descriptors: *Kentucky, *Overflow, *Dams, *Farm ponds, *Lakes, Spillways, Water levels, Rain water, Rainfall-runoff relationships, Runoff, Surface runoff, Storm water, Judicial decisions, Legal aspects, Legal review, Watercourses(Legal aspects), Water control, Water injury, Water storage.

Plaintiff farm owners brought an action for injunctive relief and to recover damage resulting from the overflow of water from defendants' dam-created lake. Plaintiffs contended that as a result of heavy rains, water from the artificial lake on defendants' farm had flowed through the spillway and then across a road and onto plaintiffs' farm. The court agreed that a landowner who through artificial means causes water to accumulate on his land in such way as to constitute a nuisance is liable for any damage resulting from the escape of the accumulated water. The Kentucky Court of Appeals found no nuisance was created. Furthermore, defendants' use of their land was reasonable in that benefits derived from such use outweighed any harm to plaintiffs. Finally, the court held that the evidence introduced did not support a finding of any damages from the overflow. (Welch-Florida)
W76-06538

ARNETT V COMMONWEALTH DEPARTMENT OF HIGHWAYS (LIABILITY FOR DAMAGES TO CROPS CAUSED BY DIVERSION OF WATER RESULTING FROM BRIDGE CONSTRUCTION).
528 SW2d 678-79 (Ky. Ct. App. 1975). 2 p.

Descriptors: *Bridge construction, *Damages, *Kentucky, *Streams, *Diversion, Diversion losses, Structures, Engineering structures, Judicial decisions, Alteration of flow, Riparian rights, Bridge design, Bridges, Constitutional law, Civil engineering, State governments, Administrative agencies, Legal aspects, Legal review.

Plaintiff landowners sought damages from defendant Department of Highways, alleging that the state of Kentucky had constructed a bridge across a stream on plaintiffs' property which resulted in a diversion of water. This diversion, plaintiffs claimed had ruined their crops and thus constituted a taking of property without just compensation. Defendant contended plaintiffs' action was barred by the statute of limitations and that purchase of the realty by plaintiffs after construction of the bridge deprived plaintiffs of standing to sue for the allegedly destructive diversion of water. The Kentucky Court of Appeals held the controlling question to be when the damage occurred, not when the bridge was built. Thus the complaint was not barred by the statute of limitations. On the standing question, the court held that, not withstanding plaintiffs' purchase of the property, if the state was creating a nuisance, plaintiffs could sue for compensation. The trial courts decision was reversed and remanded. (Welch-Florida)
W76-06539

SIERRA CLUB V. MORTON (PROHIBITION OF DAMS AND DIKES ACROSS NAVIGABLE WATERS UNDER RIVER AND HARBORS ACT OF 1899).
400 F. Supp. 610-52 (ND Cal. 1975). 43 p, 1 map.

Descriptors: *Navigable waters, *California, *Inter-basin transfers, *Water transfer, *Rivers and Harbors Act, Water supply development, Water resources, Water management(Applied), Water rights, Judicial decisions, Permits, Legislation, Dams, Environmental effects.
Identifiers: *Environmental impact statement, *California Water Project.

To redistribute California's water supply from water-rich areas to water-deficient areas, several water transfer facilities were constructed pursuant to the California Water Project. Protesting the construction and operation of these facilities plaintiff conservation groups brought an action contending that a permit was required under the Rivers and Harbors Act of 1899 before such operation could continue. The plaintiffs also contended that any such permit issuance would constitute a major federal action requiring the preparation of an environmental impact statement (EIS). At trial, the court agreed that the operation of two water project plants interfered with the navigable capacity of various waters in violation of the Rivers and Harbors Act, but rejected the plaintiffs' claim that certain structures of the project plants constituted dams or dikes over or in navigable waters. As to the EIS claim, the court found that the issuance of the permit would constitute a major federal action; however, the Army Corps of Engineers was not required to prepare an EIS if another agency was already in the process of issuing one concerning the same action. (Hoffman-Florida)
W76-06540

UNITED STATES V KENNECOTT COPPER CORP (VIOLATION OF STATUTORY REQUIREMENT TO IMMEDIATELY REPORT OIL DISCHARGE INTO NAVIGABLE WATERS).
523 F2d 821-24 (9th Cir 1975). 4 p.

Descriptors: *Oil pollution, *Administrative agencies, *Federal Water Pollution Control Act, *Oil spills, Water pollution, Legal aspects, Water law, Legislation, Federal government, Judicial decisions, Law enforcement, Water pollution sources, Water pollution control, Oil pollution, Pollutants, Water quality, Water quality control, Water quality act.
Identifiers: FWPCA Amendments of 1972, Administrative regulations.

Defendant corporation was convicted of a violation of a provision of the Federal Water Pollution Control Act Amendments of 1972 requiring that any person in charge of an onshore oil facility immediately notify an appropriate governmental agency of a known oil spill. Defendant appealed the conviction contending that the provision was void for vagueness because the statute failed to define adequately the terms 'immediately notify' and 'appropriate governmental agency'. The Court of Appeals held that the provision was valid since the statutory scheme clearly defined the term 'appropriate governmental agency' as encompassing any federal agency concerned with water and environmental pollution or navigable waters. The term 'immediately notify' was deemed to require notification be given reasonably promptly. The judgement was affirmed. (Nursey-Florida)
W76-06541

SOUTHERN NAT. GAS CO. V GULF OIL CORP. (LIABILITY FOR DAMAGES TO UNDERWATER PIPELINE BY DREDGE WHICH WAS A 'VESSEL IN NAVIGATION').
320 So2d 917-26 (3d La. Ct. App. 1975). 10 p.

Descriptors: *Damages, *Navigable waters, *Louisiana, *Dredging, *Channel improvement, Stream improvement, Channels, Water law, Legal aspects, Navigation, Ownership of beds, Streambeds, Riparian rights, Canals, Negligence, Accidents, Hazards, Risks, Judicial decisions, Penalties(Legal), Watercourses(Legal aspects), Pipelines, Underwater.
Identifiers: Comparative negligence, Admiralty law.

Plaintiff owner of a natural gas pipeline brought this suit for damages sustained when defendant corporation's dredge ruptured plaintiff's pipeline. Defendants did not contest the trial court's holding of negligence but contended that the canal in which the dredging took place was navigable and, therefore, that the substantive law of admiralty required the application of the doctrine of comparative negligence. The Louisiana Court of Appeals agreed with defendant, finding the canal to be a navigable waterway even though it was privately owned, and that even if the pipeline was beneath the surface of the water, such damage was caused by a vessel in navigation on navigable waters. Thus the application of substantive admiralty law was required. Furthermore, plaintiff's failure to remove the pipeline or to place adequate warning signs along it even after a prior dredging accident rendered the plaintiff equally at fault in the canal dredging accident. Consequently the court required plaintiff to bear half the loss. (Welch-Florida)
W76-06542

WESTERRELT V. NATURAL RESOURCES COMMISSION (RULES TO REGULATE WATERCRAFT AND LIVERIES ON THE AUSABLE, MANISTEE, PINE AND PERE MARQUETTE RIVERS VOID AS OVERBROAD).
233 NW2d 640-43 (Mich. Ct. App. 1975). 4 p.

Descriptors: *Legislation, *Constitutional law, *Michigan, *Natural resources, *Watercourses(Legal aspects), Water users, Water law, Administrative agencies, Regulation, Rivers, Water sports, Pollution abatement, Wildlife conservation, Boating, Legal aspects, River regulation, Control, Control systems, Management, Penalties(Legal), Water rights.
Identifiers: Administrative regulations.

Plaintiff boat and canoe livery operators brought this section against defendant commission seeking a temporary injunction against enforcement of proposed rules regulating watercraft and liveries on the AuSable, Manistee, Pine and Pere Marquette Rivers and also seeking a declaratory judgement as to the validity of the proposed rules. The plaintiffs contended the proposed rules denied them several constitutional rights and exceeded the commission's authority. The Michigan Court of Appeals found that the legislature had not specified the method by which the commission was to effectuate its purpose nor what type procedures were to be contemplated. Since the rules, which were promulgated pursuant to legislative statute delegating complete control of wildlife preservation and of pollution prevention in state waters, failed to provide the defendant with any workable standards by which to perform the task, the rules were void and of no force or effect. (Welch-Florida)
W76-06543

COMSTOCK V. WHEELOCK ('HIGHWAY BY USER' STATUTE NOT APPLICABLE TO GIVE PUBLIC PRESCRIPTIVE RIGHT TO LAKE PROPERTY).
234 NW2d 448-52 (Mich. Ct. App. 1975). 5 p.

Descriptors: *Docks, *Easements, *Prescriptive rights, *Michigan, *Public rights, Public access, Public benefits, Legal aspects, Trespass, Judicial decisions, Right-of-way, Scenic easements,

Highways, Prescriptive rights, Water law, Riparian rights, Recreation, Boat-launching ramps.

Plaintiff property owners brought suit to halt construction by defendant adjacent landowner of a boathouse upon defendant's property which allegedly had been used by the plaintiffs and the general public for over seventy years for swimming, boating, snowmobiling and generally for access to a lake. The plaintiffs contended the property had been used and dedicated as a public highway under the 'highway by user' statute and that they had thus acquired prescriptive easement rights upon the property. The Michigan Court of Appeals held that the public could not obtain prescriptive rights in property which was used for solely recreational purposes. The court agreed with the plaintiffs that the public could acquire rights in a private roadway under the doctrine of 'highway by user', but held that in this situation the elements of the cause of action had not been met, namely: (1) a defined line used and worked upon by public authorities, (2) travelled by the public for 10 consecutive years without interruption, and (3) with such public usage open, notorious and exclusive. The court further held that such suit could properly be brought only by public officials. This plaintiff had no standing even to assert public rights. (Welch-Florida)
W76-06544

HARRIS V. BD. OF WATER AND SEWER COMM'N (RECOVERY FOR FIRE DAMAGE TO RESTAURANT FROM LACK OF WATER IN FIRE HYDRANT).
220 So2d 624-31 (Ala. 1975). 8 p.

Descriptors: *Public utilities, *Hydrants, Alabama, *Water contracts, *Dependable supply, Pumped storage, Water delivery, Water management(Applied), Water supply development, Water users, Human population, Hydrants, Equipment, Discharge(Water), Pipes, Water works, Judicial decisions, Legal aspects, Penalties(Legal), Governments, Municipal water, Water supply.
Identifiers: Sovereign immunity.

Plaintiff motel and restaurant owner brought this action against defendant board of water and sewer commissioners to recover for fire loss allegedly incurred by defendant's failure to properly maintain the public fire hydrant and supply of water to it in accordance with the contract between the defendant and the city of Mobile. The plaintiff contended he could sue for breach of that contract as a third party beneficiary; furthermore, by failing to use reasonable care in supplying water the defendant had breached its duty to the plaintiff. The Alabama Supreme Court agreed that plaintiff could sue on the contract as a third party beneficiary and that defendant did not enjoy the traditional defense of sovereign immunity for its failure to maintain an adequate water supply in the hydrants. The court found that the inadequate water supply was enough to show a breach of defendant's duty to all those within the foreseeable area of risk. (Welch-Florida)
W76-06545

...Y V. KAISER (RIGHTS OF OWNERS OF RECORDED PLATS ABUTTING CHANNEL AS COMPARED TO THOSE OF SUBDIVISION DEVELOPER).
242 NW2d 673-77 (Mich. Ct. App. 1975). 5 p, 1 ref.

Descriptors: *Michigan, *Land tenure, *Sea walls, Easements, *Real property, *Channels, Judicial decisions, Legal aspects, Water rights, Management, Retaining walls, Shore protection, Right-of-way.

Plaintiff developer had sold lots in a subdivision ordered by a channel 34 feet in width with a five foot abutting strip of land. Because of the expense involved in maintaining and repairing the existing seawall, the plaintiff brought this action seeking to have the defendant lotowners declared owners of the channel bottom and of the five foot strip. The plaintiff contended that the recorded plot and warranty deed made it clear that the land in question had been granted to the defendants. The trial court rejected the contention, however, granting summary judgement to the defendants and holding that the plaintiff was responsible for maintaining the seawall. On appeal, the judgement was reversed in part and affirmed in part. The Michigan Court of Appeals found that the wording of the warranty deed made it clear that the defendants' property was to extend only to the channel's edge. The court also found that anexpress easement to the channel over the five foot strip was granted by the deed. Consequently, since the applicable law provides that an individual who has an easement over another's property is required to maintain and repair it, the court ordered the defendants to reimburse the plaintiff for any money expended in maintaining and repairing the seawall. (Hoffman-Florida)
W76-06546

SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE -GROUNDWATER USAGE - PHASE 2,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-06551

ENVIRONMENTAL ASSESSMENT AND DESIGN: PROCEEDINGS OF A SEMINAR.
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 6G.
W76-06555

THE ECOLOGICAL BASIS FOR THE AUGUST 1, 1973 GUIDELINES OF THE COUNCIL ON ENVIRONMENTAL QUALITY, AND SOME IDEAS FOR THE PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS,
Minnesota Univ., Minneopolis. Water Resources Research Center.
For primary bibliographic entry see Field 6G.
W76-06556

FEDERAL ENVIRONMENTAL IMPACT STATEMENTS--A CASE STUDY,
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 6G.
W76-06557

ENVIRONMENTAL IMPACT STATEMENTS/ENVIRONMENTAL POLICY ACT--LEGISLATIVE INTENT,
Minnesota State Senate, St. Paul.
For primary bibliographic entry see Field 6G.
W76-06558

MINNESOTA ENVIRONMENTAL IMPACT STATEMENTS--A USERS VIEWPOINT,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 6G.
W76-06559

MINNESOTA ENVIRONMENTAL IMPACT STATEMENT REQUIREMENTS,
Minnesota Univ., St. Paul. Council on Environmental Quality.
For primary bibliographic entry see Field 6G.
W76-06560

A GUIDE TO WISCONSIN'S LAKE MANAGEMENT LAW.
Wisconsin Univ. Extension, Madison.
April 1975. 38 p.

Descriptors: *Cooperatives, *Wisconsin, *Lakes, *Management, *Legislation, Legal aspects, State governments, Water quality control, Protection, Grants, Cost-sharing.
Identifiers: *Lake rehabilitation, Property owners, Lake districts.

Wisconsin chapter 301, laws of 1973, established a joint state-local program for public lake management. Its primary goals were to protect and improve the quality of Wisconsin's lakes, to evaluate and implement various techniques of lake management, and to compile basic lake data. The lake management program involves gathering information on lake problems and identification of the causes, consideration of remedial measures, development of a plan with alternative courses of action, selection of the most feasible rehabilitation and protection proposal, and implementation of the program. To be qualified the water body must be 'accessible to the public via contiguous public lands or easements giving public access.' To be eligible projects must be for protection and rehabilitation, not cosmetic approaches which deal with symptoms but not causes of lake problems. The law provides technical and financial assistance from the state, but lake protection and rehabilitation must be initiated and carried out at the local level by a lake protection and rehabilitation district. The organization, governing body, financial powers, state aids, and boundaries of lake districts are delineated. The petition and resolution methods of lake district formation are compared. (Buchanan-Davidson--Wisconsin).
W76-06632

6F. Nonstructural Alternatives

ECONOMIC AND LEGAL ANALYSIS OF ALTERNATIVE FLOOD CONTROL STRATEGIES: PHASE I,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
J. H. Foster, and C. Willis.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-251 552 $3.50 in paper copy, $2.25 in microfiche. Massachusetts Water Resources Research Center, Amherst, Completion Report, September 1974, 15 p. OWRT B-028-MASS(3).

Descriptors: *Flood control, *Legal aspects, *Economics, *Alternative planning, *Risks, Connecticut River, Flood plains, Land use, Operations research, *Flood plain insurance, Structures, *Flood protection.

The five sub-projects of Phase I have been completed. The accomplishments of each sub-project are separately summarized. They are: Flood Proofing Decisions Under Uncertainty: An Application to the Connecticut River Basin; Flood Plain Land Use Management: An Application of Operations Research Methodology; Flood Insurance and Individual Behavior Under Uncertainty with Policy Implications; Structural Methods of Flood Control; and Legal Aspects of Flood Water Management.
W76-06159

FLOOD PLAIN INFORMATION: NORTH FORK ST. LUCIE RIVER, ST. LUCIE COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06282

FLOOD PLAIN INFORMATION: UVAS-CARNADERO CREEK, PAJARO RIVER TO UVAS RESERVOIR, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.

W76-06283

FLOOD PLAIN INFORMATION: STILL AND MAD RIVERS, TOWN OF WINCHESTER, CONNECTICUT.
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W76-06284

FLOOD PLAIN INFORMATION: COASTAL AREAS, SARASOTA COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06285

FLOOD PLAIN MAPPING,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2E.
W76-06312

FLOOD PLAIN INFORMATION: COASTAL AREAS, ST. LUCIE COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06354

FLOOD PLAIN INFORMATION: VAN DUZEN RIVER, HUMBOLT COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-06355

FLOOD PLAIN INFORMATION: SAN TIMOTEO CREEK, VICINITY OF LOMA LINDA, SAN BERNARDINO COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-06356

FLOOD PLAIN INFORMATION: UPPER ST. VRAIN CREEK, VOLUME IV, BOULDER COUNTY, COLORADO.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-06357

FLOOD PLAIN INFORMATION: SALMON BROOK, EAST BRANCH AND WEST BRANCH, GRANBY AND E. GRANBY, CONNECTICUT.
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W76-06358

FLOOD PLAIN INFORMATION: CYPRESS CREEK, ORANGE COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06359

FLOOD DAMAGE REDUCTION POTENTIAL OF RIVER FORECAST,
Wisconsin Univ., Green Bay. Coll. of Environmental Science.
H. J. Day, and K. K. Lee.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Proceedings Paper No. 12059, Vol. 102, NO. WR1, p 77-87, April 1976. 4 fig, 3 tab, 12 ref.

Descriptors: *Water resources, *Flood control, *Flood damage, *Land use, Simulation analysis, Mathematical models, Zoning, Hydrology, Economics, Flood plains, River basins, Hydraulics, *Connecticut River, Systems analysis, Estimating, Economics.

An analytical method consisting of a set of hydrologic and economic models is presented for estimating expected flood damage reduction due to simulation of flood plain actions in a river basin. The method is based on the interrelationship of the hydraulic and hydrologic features of the flood plain, physical and economic data on flood-plain structures and their contents. Synthetic stage damage curves for individual residential and commercial structures reduces the need for field data. The method was demonstrated in the Connecticut River Basin where many complex urban flood damage centers exist on the main stem as well as on the tributaries. The analysis and interpretation of the results provided an estimate of the potential value of flood warnings in a basin where a river forecast system coupled with an effective citizen response can be one of the most cost-effective alternatives. (Bell-Cornell)
W76-06435

FLOOD PLAIN AND TSUNAMI INUNDATION AREA ORDINANCE.
County of Maui, Hawaii, Ordinance No. 716 (1972). 3 p.

Descriptors: *Hawaii, *Flood plain zoning, *Flood protection, *Floodways, *Tsunamis, Floods, Channels, Flood plains, Rivers, Streams, Floodwater, Maps, Flood profiles, Floodproofing, Structures, Runoff, Reservoirs, Drainage, Agriculture, Obstruction to flow, Right-of-way, Bulkheads, Safety.
Identifiers: Flood fringe, Tsunami inundation district, Flood protection elevation, Hundred-year flood.

This ordinance establishes regulations and development standards in areas subject to flooding or tsunami inundation. Flood Plain Districts are required to be adopted and designated on the official zoning maps of the county. Uses permitted in the floodway, such as agriculture, loading, parking, and recreation, are specified. Other uses are permitted upon application to and approval by the Planning Commission. Certain uses that would reduce the efficiency or the capacity of the floodway are prohibited. Permitted uses in the Flood Fringe are specified, and certain uses in the Tsunami Inundation District, which are prohibited without application to and approval by the Planning Commission, are also specified. Requirements for proposed subdivisions within the Flood Plain District, such as for channel improvement, for channel right-of-way, and for floodproofing, are specified. Also set forth are conditions upon which the use of a structure for a lawful purpose not in conformity with the provisions of this ordinance can be continued. Violation of this ordinance is a misdemeanor. (Segall-Florida)
W76-06492

SAMPLE SUBDIVISION CONTROL ORDINANCE FOR FLOOD HAZARD AREAS.
Minnesota Dept. of Natural Resources, St. Paul.
Sept. 1971. 61 p, 3 fig, append.

Descriptors: *Adoption of practices, *Minnesota, *Flood plain zoning, *Land use, *Legislation, Land classification, Non-structural alternatives, Land management, Water zoning, Flood protection, Floodways, Regulation, Legal aspects, Penalties(Legal), Comprehensive planning, Administration, Multi-purpose projects.
Identifiers: *Plats.

In an effort to reduce the loss of life and property, and other numerous damages caused by the unwise use of flood plains, Minnesota has published a sample zoning ordinance to guide in the development of flood plain areas. The major purpose of the ordinance is to set up safeguards to assure proper land use. Thus, before any sale of land in designated flood plain areas can be consummated, the developer must submit detailed plats to the platting authority. Furthermore, the developer must convince the authority that the land can be safely used for its intended purpose. The degree of evidence that must be submitted will depend on whether the land is in a floodway area or a flood fringe area. Generally, the only land uses permitted in a floodway zone will be those with low flood damage potential such as agriculture and parking areas. In flood fringe areas, however, the restrictions will not be as severe, and approval of buildings or structures will usually be granted. The ordinance spells out in detail the procedural requirements that must be met in getting a plat approved. It also provides criminal penalties for any violations of its provisions. (Hoffman-Florida)
W76-06494

ENVIRONMENTAL MANAGEMENT FOR THE METROPOLITAN AREA CEDAR-GREEN RIVER BASINS, WASHINGTON, PART II: URBAN DRAINAGE.
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 6G.
W76-06573

THE INFLUENCE OF FLOOD HAZARDS UPON RESIDENTIAL PROPERTY VALUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
D. Damianos.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 942, $7.50 in paper copy, $2.25 in microfiche. Ph. D. Dissertation, 165 p, 12 tab, 8 fig. OWRT-A-054-Va.

Descriptors: *Flood control, Water resources, Zoning.
Identifiers: Economic Analysis, Floods.

The economic concept of property as a 'bundle o rights' accruing to ownership suggests that public actions to deal with flood hazards can affect the rights to use and, therefore, the economic value o property. Owners of property might be induced to take actions in the public choice process for selection of alternatives that favor actions enhancing property values. To test this proposition, it is necessary to determine the impact alternativ flood hazard reduction policies may have upo property values. The objectives of this study are t discuss the theoretical arguments for determinin the factors which may influence land valu changes induced by flood hazard reduction pol cies, and to empirically estimate the influence o flood hazard reduction alternatives on propert values. The research was divided into three majo areas of investigation. The basic source of dat was city courthouse and real estate appraiser records.
W76-06643

6G. Ecologic Impact Of Water Development

THE ECONOMIC VALUE OF REMOT SENSING OF EARTH RESOURCES FRO SPACE: AN ERTS OVERVIEW AND TH VALUE OF CONTINUITY OF SERVIC VOLUME IX. OCEANS.
Econ, Inc., Princeton, N. J.
For primary bibliographic entry see Field 7B.
W76-06222

A PRE-IMPOUNDMENT STUDY OF THE FIS FAUNA OF INDIAN CREEK, DEKALB COU TY, ILLINOIS,
Washington Univ., Seattle. Fisheries Researc Inst.
For primary bibliographic entry see Field 2E.
W76-06251

EARTHWATCH,
National Oceanic and AtmosphericAdministration, Rockville, Md. Deep Water Ports Project Office.
For primary bibliographic entry see Field 5A.
W76-06321

HOW THE GREAT LAKES WERE EVALUATED,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 5G.
W76-06329

SYSTEMATIC APPROACHES TO ENVIRONMENTAL IMPACT ASSESSMENT: AN EVALUATION,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
E. E. Whitlatch, Jr.
Water Resources Bulletin, Vol. 12, No. 1, p 123-137, February 1976. 3 fig, 1 tab, 25 ref.

Descriptors: *Environmental effects, *Assessment, *Evaluation, Decision making, Water resources, Projects, Mathematical models, Systems analysis.
Identifiers: *Environmental impact, Linear vector model, Nonlinear evaluation.

Increased public awareness of the environmental effects of large-scale projects and concomittant public participation in the environmental impact assessment process demand that assessment methods and procedures fulfill a wide range of desirable characteristics. These are developed and offered as specific criteria against which currently proposed environmental assessment procedures should be judged. Such procedures as checklists, matrices, networks (stepped matrices), overlays, linear vector analysis, and nonlinear evaluation systems are presented and judged in light of the proposed criteria. It is concluded that the use of checklists, the most common assessment format used to date, does not constitute a viable assessment procedure. Use of the matrix or stepped matrix techniques in conjunction with the linear vector or non-linear evaluation systems, with the latter modified slightly, is seen as an approach to environmental assessment that will achieve most of the established criteria. (Bell-Cornell)
W76-06431

PLANNING AND SELECTING MULTIOBJECTIVE PROJECTS BY GOAL PROGRAMMING,
Wesleyan Coll. Macon, Ga.
For primary bibliographic entry see Field 6A.
W76-06432

DECISIONS FOR DELAWARE: SEA GRANT LOOKS AT LEGAL ASPECTS OF OCS DEVELOPMENT,
Delaware Univ., Newark. Center for the Study of Marine Policy.
For primary bibliographic entry see Field 6E.
W76-06485

THE COMMON LAW OF PUBLIC NUISANCE AND STATE ENVIRONMENTAL LITIGATION,
For primary bibliographic entry see Field 6E.
W76-06488

THE NATIONAL ENVIRONMENTAL POLICY ACT: ITS FIRST FIVE YEARS,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
L. Deutsch.
Environmental Affairs, Vol. 4, p. 3-80 (1975). 78 p, 1 ref.

Descriptors: *Project planning, *Environmental effects, *Legal review, *Water quality control, *Environmental control, Legislation, Legal aspects, Water law, Planning, Regulation, Administration, History, Comprehensive planning, Governmental interrelations, Water policy, Federal jurisdiction, Federal government, Adoption of practices, Judicial decisions.
Identifiers: *Environmental Impact Statement(EIS), *National Environmental Policy Act.

A survey is presented of the requirements of the National Environmental Policy Act (NEPA) within the framework of relevant federal guidelines and court decisions of major significance reported prior to January 1, 1975. The first section of the article analyzes the Act as passed by Congress together with the applicable executive orders and Council on Environmental Quality regulations which have interpreted it. The second section deals with judicial interpretation of NEPA, and discusses various topics involved with this interpretation, including: (1) threshold issue; (2) adequacy of the environmental impact statement; (3) other rights created by NEPA; and (4) substantive rights under the NEPA. One of the most publicized and litigated provisions of NEPA is the procedural mandate which requires the issuance of an environmental impact statement to accompany every report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. Because of the pervasive impact this requirement has put on all major development projects, special emphasis and consideration is given to judicial interpretation of the phrase 'major Federal action significantly affecting the quality of the human environment'. Emphasis is also placed on what the courts have required as to the adequacy of facts and information presented in the environmental impact statements. (Hoffman-Florida)
W76-06490

SIERRA CLUB V. MORTON (PROHIBITION OF DAMS AND DIKES ACROSS NAVIGABLE WATERS UNDER RIVER AND HARBORS ACT OF 1899).
For primary bibliographic entry see Field 6E.
W76-06540

ENVIRONMENTAL ASSESSMENT AND DESIGN: PROCEEDINGS OF A SEMINAR.
Minnesota Univ., Minneapolis. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-251 909, $4.50 in paper copy, $2.25 in microfiche. Bulletin No. 78, January 1975, 54 p. OWRT A-999-MINN(34)

Descriptors: *Minnesota, Design, Planning, *Environmental effects, Water quality standards, *Legislation, Legal aspects.
Identifiers: *Environmental Impact Statement.

The purpose of this publication is to provide information on Federal and State (Minnesota) environmental impact statement requirements. Topics discussed include the intent of the environmental impact legislation, projects which require impact statements, and information which should be included in environmental impact statements. Case studies detailing positive and negative aspects of the environmental impact statement process are presented. (See W76-06556 thru W76-06560) (Waelti-Minnesota)
W76-06555

THE ECOLOGICAL BASIS FOR THE AUGUST 1, 1973 GUIDELINES OF THE COUNCIL ON ENVIRONMENTAL QUALITY, AND SOME IDEAS FOR THE PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS,
Minnesota Univ., Minneapolis. Water Resources Research Center.
B. E. Willard.
In: Minnesota Water Resources Research Center, Bull 78, p. 1-10, January 1975. 11 p.

Descriptors: *Balance of nature, *Comprehensive planning, *Ecosystems, *Environmental effects, Niches, Economics, Evaluation, Conservation, Decision making, Project planning, Food chains, Engineering, Environmental engineering, Biology, Evolution, Path of pollutants, Pollutants, Pollution abatement, Limiting factors, Alternate planning, Ecology.
Identifiers: *Environmental Impact Statements, National Environmental Policy Act.

This report evaluates guidelines for Environmental Impact Statements established by the Council on Environmental Quality as tools for continuing the policy of the Federal Government to use all practicable means and measures in a manner calculated to create and maintain conditions under which man and nature can exist in productive harmony. These guidelines are based on the premise that everything on earth affects everything else, directly or indirectly. Nothing operates in isolation. Ecological-environmental research should be commenced even before projects are conceived. This research should be conducted from the holistic viewpoint to determine the overall long-range environmental repercussions of any project. The '3E's' (engineering, ecology and economics) should be considered as a unit, mutually supportive of one another. Potential alternative sites and alternative means of accomplishing projects should be objectively evaluated so that the project can be accomplished with minimal adverse environmental effects. (See also W76-06555) (Nursey-Florida)
W76-06556

FEDERAL ENVIRONMENTAL IMPACT STATEMENTS--A CASE STUDY,
Army Engineer District, St. Paul, Minn.
R. F. Post.
In: Minnesota Water Resources Research Center, Bull 78, p. 11-28, January 1975. 18 p, 2 map, 1 tab, 2 chart.

Descriptors: *Environmental effects, *Decision making, *Cost-benefit analysis, *Project planning, Economics, Evaluation, Conservation, Engineering, Environmental engineering, Environmental control, Balance of nature, Economic justification, Social impact, Economic feasibility, Economic impact, Social values, Pollutants, Water pollution effects, Pollution abatement, Alternate planning, Federal government, Turbidity.
Identifiers: *Environmental Impact Statement.

This report discusses Environmental Impact Statements prepared by the Corps of Engineers for two separate projects. These case studies are used to illustrate the procedure followed by the Corps of Engineering in preparing Environmental Impact Statements. The author states that in preparing these statements, the Corps attempts to develop proposals to balance the environmental development needs of the nation. The Corps considers the following factors: the possible detrimental effects of the proposed project on the environment of the area; the costs and impact of various alternative methods of carrying out the project; the costs to be incurred and benefits to be received from the economic and social effects of the proposed project. After considering all of these factors, the Corps must then make a final determination whether to recommend approval or disapproval of the proposed project. (See also W76-06555) (Nursey-Florida)
W76-06557

ENVIRONMENTAL IMPACT STATEMENTS/ENVIRONMENTAL POLICY ACT--LEGISLATIVE INTENT,
Minnesota State Senate, St. Paul.
W. Borden.
In: Minnesota Water Resources Research Center, Bull 78, p. 29-35, January 1975. 6 p.

Descriptors: *Minnesota, *Project planning, *Environmental effects, Economics, Evaluation, Conservation, Decision making, Engineering, Environmental engineering, Pollutants, Pollution abatement, Economic impact, Social impact, Legislation, Social values, Ecology, Environmental control, State governments, Federal government.
Identifiers: *Environmental Impact Statement, *State policy, National Environmental Policy Act, Chapter 412 of Minnesota Laws of 1973, Injunctions(Prohibitory).

This report discusses the legislative intent of Chapter 412 of Minnesota Laws 1973. The stated purposes of the law are: (1) to declare a state policy that will encourage productive harmony between man and his environment; (2) to promote efforts that will prevent or eliminate damage to the environment; and (3) to enrich the understanding of ecological systems and natural resources important to the state or nation. The author states that it is the intent of the law to force developers and governmental units to seriously consider the immediate and future social, economic and environmental impact of proposals, to insure public input, and to provide a procedure for evaluating, and if necessary, halting injurious projects. The intent of this law can be carried out through the use of Environmental Impact Statements, public hearings on draft statements, and enforcing permit refusals with the necessary court action to enjoin construction of disapproved projects. The author concludes that this system is not state land use planning in disguise; the system allows local initiative, but places environmental checks on it. (See also W76-06555) (Nursey-Florida)
W76-06558

MINNESOTA ENVIRONMENTAL IMPACT STATEMENTS--A USERS VIEWPOINT,
Minnesota Univ., Minneapolis. Water Resources Research Center.
G. C. Hite.
In: Minnesota Water Resources Research Center Bulletin 78, p. 43-54, January 1975. 12 p.

Descriptors: *Minnesota, *Project planning, *Economic impact, *Costs, State governments, Federal government, Environmental control, Legislation, Environmental engineering, Investment, Social impact, Economics, Profit, Capital costs, Financing, Conservation, Environmental effects.
Identifiers: *Environmental Impact Statement, *Minnesota Environmental Policy Act, National Environmental Policy Act.

This report discusses the effects of state environmental impact statements requirements on the land development business in Minnesota. The author states that due to environmental restrictions, many excellent development sites will no longer be available for construction. Sites that will be available are expected to cost significantly more. The author also states that because many of the new review areas are susceptible to a highly subjective judgement analysis, there is an increased uncertainty about public approval of the proposal. Both of these factors will lead to increased land development costs and the possibility of a decrease in return on investment. The author further states that the Minnesota requirements will give a competitive advantage to those companies which have developed in the environmental sciences. The author, however, generally praises the Minnesota Environmental Impact Statement requirements for eliminating or modifying many of the problem areas of the federal law. The author concludes that environmental consciousness is maturing in this country and that good business practices and good environmental practices are consistent and should be mutually supportive. (See also W76-06555) (Nursey-Florida)
W76-06559

MINNESOTA ENVIRONMENTAL IMPACT STATEMENT REQUIREMENTS,
Minnesota Univ., St. Paul. Council on Environmental Quality.
J. Mohr.
In: Minnesota Water Resources Research Center, Bull 78, p. 36-42, January 1975. 7 p.

Descriptors: *Minnesota, *Project planning, *Decision making, *Environmental effects, Economics, Evaluation, State governments, Federal government, Legislation, Conservation, Engineering, Environmental engineering, Pollution abatement, Cost-benefit analysis, Economic impact, Social impact, Social values, Environmental control, Economic justification, Alternate planning.
Identifiers: *Environmental Impact Statement, *Minnesota Environmental Policy Act, National Environmental Policy Act.

This report discusses the Minnesota environmental impact statement process. Although the Minnesota Environmental Policy Act is modeled after the National Environmental Policy Act of 1969, the impact statement requirements in the Minnesota Act go beyond the requirements of the Federal Act. The Minnesota Act requires preparation of Environmental Impact Statements on 'major public actions with the potential of significant environmental effects' or 'major private actions of more than local significance with the potential for significant envionmental effects'. The law also provides for a procedure whereby persons can petition for the requirement of an impact statement on a given project. The Environmental Impact Statements must include: (1) a description of the project; (2) the environmental impact of the proposed project, including a description of the resources in the area that will be affected, any direct or indirect environmentl, economic and employment effects and any irreversible and irretrievable commitments of resources that would be involved; (3) alternatives to the proposed project; (4) impact on state government of any federal controls associated with the proposed project; (5) the multi-state responsibilities associated with the proposed action; and (6) organizations and persons consulted. (See also W76-06555) (Nursey-Florida)
W76-06560

ENVIRONMENTAL MANAGEMENT FOR THE METROPOLITAN AREA CEDAR-GREEN RIVER BASINS, WASHINGTON, PART II: URBAN DRAINAGE.
Army Engineer District, Seattle, Wash.
December 1974. 107 p, 75 fig, 24 tab, 160 ref, glossary. DACW 67-76-C-0002.

Descriptors: Planning, *Non-structural alternatives, Water management(Applied), *Drainage systems, Water resources, Social impacts, *Environmental effects, Government, *River Basin Development, Land management, *Comprehensive planning, *Urban drainage, Storms, Runoff, *Washington, Legislation, Zoning, Land use.
Identifiers: Green River(WA), Cedar River(WA), River Basin Coordination Committee(RIBCO), Seattle(WA).

This report contains the results of the overall study and establishes the basis for the study recommendations. A coordinated basin-wide approach to storm water management is recommended in order to protect and preserve the area streams in as natural a state as possible. A drainage plan detailing the combination of control methods suitable for the regional sub-basins and including a procedure for implementation should be worked out. Opinions of citizens in each subbasin should be reflected in the plan. A common set of guide lines, permit procedures and drainage management requirements should be developed for the two counties. An equitable service charge should be the primary source of funds with State and Federal funds considered as additional sources where available. Construction of the 31 drainage facilities listed is recommended only after additional detailed design and coordinated planning are completed. Open natural drainage, wet lands and holding ponds should be preserved wherever practical. Flood plain zoning and site development ordinances should be used to control drainage and runoff. The study includes the River Basin Coordinating Committee, the environmental management program, the study area, environmental problems related to urban drainage, basis and methodology used for development of alternative plans, community involvement, and jurisdictional and financial aspects. (Hufschmidt - North Carolina)
W76-06573

KANEOCHE ALTERNATIVES: AN APPLICATION OF IMPACT METHODOLOGY.
Hawaii Environmental Simulation Lab., Honolulu. Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 736, $5.50 in paper copy, $2. 25 in microfiche. Prepared for the National Science Foundation, Washington, D.C. 1974. 134 p, 1 fig, 10 tab, 32 plates, 17 ref. GI-36224.

Descriptors: Planning, *Non-structural alternatives, *Alternative planning, *Future planning(Projected), Model studies, Projections, Social aspects, Environmental effects, *Urban drainage, Urbanization, *Land use, Growth rates, Water resources development, Water quality, Water distribution, *Hawaii, Methodology.
Identifiers: *Kaneoche Bay(HI), Oahu(HI).

This report represents a broad range of information related to alternative futures for the Kaneoche Bay region in northeastern Oahu Island, Hawaii. The study develops, improves and demonstrates a variety of planning methods of environmental assessment useful to evaluate consequences of urban growth. Based on different assumptions about the type, pace and scale of urban development, three scenerios are projected for 1995: (1) assume the existing general plan for the region guides development; (2) private developers plans indicate land use change; and (3) limits to those areas which appear environmentally suitable for urbanization. An overview of the study area is presented, followed by an analysis of the environmental impact of the alternative policies on urban land and water resources uses. Carrying capacity overload capacity and need to retain flexibility and adaptability in planning tools serve as evaluative criteria for the scenerios. Simulation models representing a wide diversity of geographic hydrologic and site development factors were developed to project possible environmental consequences. These models included Small Watershed Peak Discharge Model, Universal Soil Loss Equation, Sewer Alignment Model and Sewer Network Volume/Capacity Model. Water problems were identified to be water distribution and water quality. Each scenerio provides alternatives for waste water treatment, flood protection and water distribution and measures their costs. Community interaction and social impact assessment of each scenerio are discussed. (Salzman - North Carolina)
W76-06574

DYNAMICS OF MARSH LAND FORMATION AND SUCCESSION ALONG THE LOWER COLORADO RIVER AND THEIR IMPORTANCE AND MANAGEMENT PROBLEMS AS RELATED TO WILDLIFE IN THE ARID SOUTHWEST,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4A.
W76-06589

THE RATIONALE OF NOMAD ECONOMY,
Uppsala Univ. (Sweden).
For primary bibliographic entry see Field 4C.

W76-06591

DESERTIFICATION: A WORLD PROBLEM,
Worldwatch Inst., Washington, D.C.
For primary bibliographic entry see Field 4C.
W76-06592

THE MEDICINE BOW ECOLOGY PROJECT: THE POTENTIAL SENSITIVITY OF VARIOUS ECOSYSTEM COMPONENTS TO WINTER PRECIPITATION MANAGEMENT IN THE MEDICINE BOW MOUNTAINS, WYOMING,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 5C.
W76-06610

AN ASSESSMENT OF THE EXPECTED IMPACT OF A DREDGING PROJECT PROPOSED FOR PALA LAGOON, AMERICAN SAMOA,
Hawaii Univ., Honolulu. Sea Grant Program.
P. Helfrich, J. L. Ball, Jr., P. Bienfang, M. Foster, and B. Gallagher.
UNIHI-SEAGRANT-TR-76-02, October 1975. 76 p, 18 fig, 7 tab, 49 ref, 5 append, $2.50. Grant 2-35243.

Descriptors: *Dredging, Environment, *Environmental effects, Channel improvement, Aquatic life, Aquatic environment, Biota, Ecosystems, Biology, Ecology, Marine biology, Lagoons, *Social impact, *Economic impact, Pacific Ocean, Water pollution effects.
Identifiers: *Pala Lagoon(American Samoa).

Biological and socio-economic effects are assessed of a dredging project proposed for Pala Lagoon, American Samoa. Emphasis is placed on the expected impact the project would have upon the tides and circulation, bacterial contamination, phytoplankton productivity, coral and echinoderms, and fishes of Pala Lagoon. The data collected indicate that dredging would remove an existing sill and, although the volume flow through the entrance channel would be increased, the turbulent mixing process between ocean and lagoon would be decreased, and, as a result, the average residence time of water in the lagoon would be increased. Since the dredging is not believed to enhance the effective tidal dilution, this project is not expected to improve the microbial quality of the lagoon. Any perturbations affecting the coral (such as dredging) can be expected to have a profound effect on the rest of the community for an extended period. Increased residence time of water in the lagoon, caused by dredging, would be detrimental to delicate fish larvae. (NOAA)
W76-06654

7. RESOURCES DATA

7A. Network Design

REMOTE SENSING OF RESOURCES IN ARID LANDS,
Arizona Univ., Tucson. Office of Arid Lands Studies.
. D. Johnson, L. K. Lepley, and K. E. Foster.
Proceedings in: International Seminar on Land Evaluation in Arid and Semi-Arid Zones of Latin America, Rome, February 4-7, 1974. p. 65-77 1975, 4 ref.

Descriptors: *Remote sensing, *Arid lands, Satellites(Artificial), *Water resources, Mapping, Arizona, Resources, Aerial photography, Infrared radiation, Radar, Terrain analysis, Surveys, Hydrology, Vegetation, Land use, Fossil fuels, Natural resources, Photography, Computers.
Identifiers: Tortolita project(Ariz), Composite computer mapping.

Increasing population pressures in congested areas have led to new interest in sparsely populated arid lands. This interest is largely due to advances in water technology that may greatly change a capacity of deserts to support more people. Remote sensing, the science of acquiring information through devices such as cameras, radar, lasers, thermal infrared sensors, and other instruments remote from that which is being measured should lead to better resource management and inventory techniques. Management of arid lands resources requires a 3-step process: inventory, analysis, and operations or development. Aspects of remote sensing as they apply to arid land resource inventory are discussed. Photographic capabilities (including multiband photographs, multidate photographs, and multistage photographs) of the Earth Resources Technology Satellite (ERTS) are reviewed. Major resource applications of remote sensing include hydrology and water resources, vegetation, soil resources, minerals and fossil fuels, marine resources, land use, and land use ghanges. The use of computer mapping as a data handling technique in conjunction with remote sensing is discussed. A brief description of the Tortolita project in Arizona is included. The composite computer mapping technique is described in 3 steps: (1) select relevant factors, (2) construct functional groups and assign weights, and (3) assign weights to individual factor maps. (Robinett-Arizona)
W76-06260

DATA COLLECTION SYSTEMS AND THEIR IMPACT ON THE FUTURE DEVELOPMENT OF HYDROLOGY,
Department of the Environment, Reading (England). Water Data Unit.
J. C. Rodda.
Water Services, Vol. 79, No. 947, p 10-15, January 1975. 5 fig, 26 ref.

Descriptors: *Data storage and retrieval, *On-site data collections, *Satellites(Artificial), *Remote sensing, Hydrology, *Hydrologic data, *Data collections, Automatic control, Compute models, Simulation analysis, Water resources, Snow surveys.
Identifiers: Delaware River Basin(MD), Thetford Forest(United Kingdom).

Some recent advances in hydrolog are examined. Integrated data collection systems are becoming more frequent, yet these systems range in complexity from single measuring devices which continuously measure a single variable to systems which record vast amounts of information over wide areas and transmit to one or more bases. Examples are cited. (1) In the Thetford Forest (United Kingdom) a project is being undertaken to establish the evaporative characteristics of Scots pine through the use of a computer-controlled data acquisition system and simulation model. Thirty meter towers carry pairs of aspirated quartz crystal, wet and dry bulb thermometers, anemometers and wind vanes. The computer collects observations from 110 sensors and lists hourly averages and draws profiles. (2) Snow surveys are being made by satellite to determine extent, depth, and water equivalent of snow. By using infared sensors and photographs, on flat terrain extent of snow could be determined within 20 km and mountainous terrain within 150-200 m. (3) In order to predict stream flow following rainfall, radar is being used to continuously monitor a water basin in the United Kingdom. The radar information is calibrated through the use of a computer model. Flow forecasts are highly accurate. (4) In the Delaware River Basin (MD) satellite-based collection is supplementing more traditional data collection methods to give data on water quantity, dissolved oxygen, temperature, conductivity and pH. Five aspects of systems and data are becoming crucial: reliability, representativeness, impartiality, relevance, and continuity. During the next several decades it is likely these systems will be consolidated. (Smith - North Carolina)
W76-06277

EARTHWATCH,
National Oceanic and AtmosphericAdministration, Rockville, Md. Deep Water Ports Project Office.
For primary bibliographic entry see Field 5A.
W76-06321

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 2B.
W76-06606

LAKE HURON BEGINNING-OF-MONTH WATER LEVELS AND MONTHLY RATES OF CHANGE OF STORAGE,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2H.
W76-06657

AGRICULTURAL DROUGHT OF 1972 KHARIF SEASON,
Meteorological Office, Poona (India).
For primary bibliographic entry see Field 2B.
W76-06681

A SIMPLE RAIN-GAUGE FOR DENSE NETWORK RESEARCH,
Newport Grammar School, Essex (England).
For primary bibliographic entry see Field 2B.
W76-06694

7B. Data Acquisition

BULK DENSITY SAMPLER FOR DEEP SOIL PROFILES,
California Univ., Riverside.
K. M. Holtzclaw, J. M. Rible, and P. F. Pratt.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1220-1223, November-December 1975. 4 fig, 2 tab, 3 ref. NSF GI 34733X.

Descriptors: *Sampling, *Bulk density, *Instrumentation, *Soils, *Soil profiles, Drilling, Drilling equipment, Fertilizers, Irrigation, Salts.
Identifiers: *Deep soil profiles, Soil samples, Drilling unit, Soil core method, Soluble ions, Bucket augur.

A bulk density sampler, adapted from a conventional commercial type, was constructed and used to obtain soil samples at more than 50 sampling sites from depths to 30 m. This sampler increased the speed with which samples were taken because it was readily added to or detached from the drilling unit between sequences of drilling. Evaluations showed that the sampler obtained bulk density values quite comparable to those found with an undisturbed soil core method. (Roberts-ISWS)
W76-06171

MEASUREMENT OF THE STRUCTURE OF RIVER FLOW,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2E.
W76-06180

MEASUREMENT OF SMALL STRAIN-RATES OVER SHORT TIME PERIODS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Glaciology Div.
For primary bibliographic entry see Field 2C.
W76-06184

THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME IX. OCEANS.
Econ, Inc., Princeton, N. J.
Available from the National Technical Information Service, Springfield, Va 22161 as N75 14214, $6.00 in paper copy, $2.25 in microfiche. National Aeronautics and Space Administration, Report NASA-CR-141270, December 1974. 133 p. 8 fig., 17 tab. NASW-2580

Descriptors: *Economic impact, *Benefits, *Remote sensing, *Resources, *Oceans, Oceanography, Satellites(Artificial), Weather forecasting, Marine plants, Polar regions, Data collections, Fish management, Mapping, Conservation, Ice, Navigation, Forecasting, Tides, Hurricanes, Currents(Water), Oil pollution, Marine fisheries, Navigation, Coasts, Shore protection, Water pollution control, Estuaries, Law enforcement, Regulation, Monitoring, Legal aspects, *Marine resources, Coastal zone management.

Satellite imagery permits study to a depth of about sixty meters below the ocean surface, the part of the sea which most affects mankind and which he most affects. Almost all important ocean parameters can be sensed from satellites or communicated via satellite using Data Collection Platforms. Satellite imagery is valuable in mapping oceans, ice and polar caps, and water temperature; monitoring food supplies, tides, currents, and oil slicks; optimizing ocean fisheries management and shipping routes; improving coastal zone management and shoreline protection; controlling ocean pollution; and reducing loss of ocean resources due to man-made changes. Remote sensing enhances research on ocean parameters and estuarine ecology. It can be used to design and enforce national and international regulations and agreements. Cost-saving benefits are quantified and user demand for information identified; unquantified benefits are significant. The primary factor making quantification difficult is that the information obtained will be of greatest benefit as input to forecasting models which are yet to be constructed. Applicable federal budgets for specific agencies and laws and statutes governing remote sensing of oceans are summarized. Hard benefits would range from $6.78-17.04 million. (Buchanan-Davidson--Wisconsin)
W76-06222

WATER CONTENT AND BULK DENSITY CHANGES IN A SOIL PEDON MEASURED WITH DUAL ENERGY GAMMA-RAY TRANSMISSION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5G.
W76-06238

REMOTE SENSING OF RESOURCES IN ARID LANDS,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 7A.
W76-06260

ORBITAL AND HIGH ALTITUDE IMAGERY AS A MANAGEMENT TOOL FOR LAND USE AND FLOOD HAZARD STUDIES,
Arizona Univ., Tucson. Office of Arid Land Studies.
For primary bibliographic entry see Field 4A.
W76-06262

MEASUREMENT IN WATER RESEARCH: PART 1.
For primary bibliographic entry see Field 5A.
W76-06310

INSTRUMENTS FOR WATER AND SEWAGE TREATMENT PLANTS (JOGESUIDO KEISO KIKI),
Tokyo Shibaura Electric Co., Ltd. (Japan).
K. Sekimoto, K. Nakakuma, M. Ito, T. Hayashi, and H. Hashimoto.
Toshiba Rebyu, (Toshiba Review) Vol. 30, No. 11, p 804-808, October, 1975. 10 fig, 3 tab.

Descriptors: *Water supply, *Waste water treatment, *Equipment, *Instrumentation, Control, Control systems, Monitoring, Measurement, Automation.

The expansion of the scale of water supply and waste water treatment has increased the importance of control equipment for these applications. Descriptions are presented for the newest instruments for water supply and sewage treatment control systems. The equipment includes high-precision electromagnetic flowmeters, maintenance-free water quality sensors, and water meters for centralized reading. (Orr-FIRL)
W76-06347

TRANSMISSOMETER MEASUREMENTS OF THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
K. P. B. Thomson, and J. Jerome.
Scientific Series No. 53, 1975, 10 p, 13 fig, 6 ref.

Descriptors: *Measurements, Investigations, *On-site investigations, Surveys, *Monitoring, Data collections, Limnology, Analysis, *Great Lakes, Instrumentation.
Identifiers: *Transmissometer.

Beginning in 1973 in situ measurements of the optical beam attenuance or transmittance have been obtained on the Great Lakes during the CCIW monitoring cruise program. The instrument used for these measurements and the operational procedure are described. Sample data from each cruise are presented for reference purposes. The transmittance or attenuance data for Lakes Superior, Erie and Ontario are described in terms of their relation to other limnological parameters. Relations observed in the analyses of the optical data show that the beam transmittance or attenuance is an important limnological parameter for the surveillance of the Great Lakes. (Environment Canada)
W76-06370

DETERMINATION OF SNOW DEPTH AND SNOW EXTENT FROM NOAA 2 SATELLITE VERY HIGH RESOLUTION RADIOMETER DATA,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2C.
W76-06383

CHROMATOGRAPHIC DETERMINATION OF DMA AND DMF IN AQUEOUS MEDIUM,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Petroleum Technology and Petrochemistry.
For primary bibliographic entry see Field 5A.
W76-06390

SEMI-AUTOMATED AMMONIA PROBE DETERMINATION OF KJELDAHL NITROGEN IN FRESHWATERS,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5A.
W76-06391

A COMPARISON OF THE RESPONSES OF IDENTICAL CUP ANEMOMETERS MOUNTED ON A SPAR AND A TOROID BUOY,
Oregon State Univ., Corvallis. School of Oceanography.
W. V. Burt.
Journal of Physical Oceanography, Vol. 5, No. 4, p 789-792, October 1975. 4 fig, 13 ref. NSF OCD71-00271 A05.

Descriptors: *Anemometers, *Winds, *Instrumentation, Buoys, Waves(Water), Statistical methods, Wind velocity, Oceans.
Identifiers: *Errors, Standard deviation, Spar buoys, Toroid buoys.

In experiments with identical cup anemometers, one mounted on a spar buoy and one mounted on a toroid buoy that were anchored close together, the anemometer mounted on the toroid indicated consistently higher 10-min integrated averages of wind speed than the cup anemometer mounted on the spar buoy. The difference was 7% of the mean wind speed and was linear over a range of mean wind speeds from 1.5 to 9.5 m/s. (Jones-ISWS)
W76-06392

CLASSIFICATION OF WETLANDS VEGETATION USING SMALL SCALE COLOR INFRARED IMAGERY,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 2L.
W76-06411

PORE WATER PRESSURE MEASURING DEVICE,
For primary bibliographic entry see Field 2G.
W76-06477

DEVELOPMENT OF METHODOLOGY FOR EVALUATION AND PREDICTION OF AVALANCHE HAZARD IN THE SAN JUAN MOUNTAIN AREA OF SOUTHWESTERN COLORADO,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W76-06605

EVALUATION OF AIRBORNE RAINDROP SIZE-DISTRIBUTIONS MEASUREMENTS FOR IMPROVING RADAR RAINFALL ESTIMATES,
Meteorology Research, Inc., Altadena, Calif.
For primary bibliographic entry see Field 2B.
W76-06608

SATELLITE SUPPORT TO THE HIPLEX ACTIVITIES FOR 1975,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W76-06613

SEASONAL STREAMFLOW ESTIMATION EMPLOYING SATELLITE SNOWCOVER OBSERVATIONS,
National Aeronautics and Space Administration Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 4A.
W76-06638

ENVIRONMENTAL APPLICATIONS OF ADVANCED INSTRUMENTAL ANALYSIS ASSISTANCE PROJECTS, FY 74,
Southeast Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5A.
W76-06647

USE OF RADAR INFORMATION IN DETERMINING FLASH FLOOD POTENTIAL,
National Weather Service, Garden City, N.Y. Eastern Region.
For primary bibliographic entry see Field 4A.
W76-06653

DEVELOPMENT OF SNOW WATER EQUIVALENT SURVEY METHODS USING AIRBORNE GAMMA MEASUREMENTS,
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 2C.
W76-06659

OPERATIONAL CHARACTERISTICS OF THE DECCA LAMBDA (6F) POSITIONING SYSTEM OVER FRESH WATER,
Canadian Hydrographic Service, Ottawa (Ontario).
F. L. DeGrasse, and P. Brunaus.
IFYGL Tech. Man. No. 7; (1975), 52 p.

Descriptors: *Lakes, *Lake Ontario, *Navigation, *Electromagnetic waves, Radio waves.
Identifiers: Radio wave propagation, Phase lag, DECCA Lambda positioning system.

Establishment of the DECCA Lambda (6f) positioning system for the International Field Year Great Lakes study of Lake Ontario and Basin provided an opportunity to evaluate the equipment in the hyperbolic mode and more importantly to determine phase lag effect on electromagnetic waves in a fresh water environment. A number of calibrations/evaluations were carried out throughout the Field Year under varying meteorological and land-sea media conditions to determine a more accurate figure for Velocity of Propagation of radio waves over fresh water and its application to electronic positioning in similar fresh water bodies. The bathymetric survey of Lake Ontario will be accounted for in some detail together with the automated collecting, processing and portrayal of the data. This survey is the first major effort at metrication in the Great Lakes. (NOAA)
W76-06662

SOIL MOISTURE SURVEY EXPERIMENT AT LUVERNE MINNESOTA, DATE OF SURVEY: MAY 12, 1975,
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 2G.
W76-06663

SOIL MOISTURE SURVEY EXPERIMENT AT PHOENIX, ARIZONA, DATE OF SURVEY: MARCH 18, 1975,
EG and G, Inc., Las Vegas. Nev.
For primary bibliographic entry see Field 2G.
W76-06664

SNOW WATER EQUIVALENT SURVEYS OF THE SOURIS RIVER BASIN,
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 2C.
W76-06665

THE MEASUREMENT AND RECORDING OF RAINFALL INTENSITIES,
For primary bibliographic entry see Field 2B.
W76-06692

APPLICATIONS OF AEROSPACE TECHNOLOGY IN THE PUBLIC INTEREST: POLLUTION MEASUREMENT,
Denver Research Inst., Colo.
For primary bibliographic entry see Field 5C.
W76-06710

TELEDETECTION BY AIRPLANE AND SATELLITE IN THE STUDY OF MARINE POLLUTION, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 5A.
W76-06717

STUDIES ON THE EFFECT OF SOIL DENSITY, TEMPERATURE AND FERTILIZATION OF THE SOIL MOISTURE, VALUE OBTAINED WITH A DIELECTRIC MEASURING TECHNIQUE, (IN GERMAN),
For primary bibliographic entry see Field 2G.
W76-06727

THE DETERMINATION OF CARBOHYDRATES IN NATURAL WATERS: A COMPARISON OF PAPER CHROMATOGRAPHIC: COLORIMETRIC AND ENZYMATIC METHODS, (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Institut.
For primary bibliographic entry see Field 5A.
W76-06773

THE TECHNIQUE OF REMOVING LARGE UNDISTURBED SAMPLES OF LAKE SEDIMENT: AN IMPROVED BORE PLUMB, (IN GERMAN),
For primary bibliographic entry see Field 2J.
W76-06776

VEGETATION IN LAKE TAMNAREN: INTERPRETATION OF AERIAL PHOTOS AND DESCRIPTION OF THE VEGETATION, (IN SWEDISH),
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 2H.
W76-06781

FLOODING EFFECTS ON LIGHT REFLECTANCE, TRANSMITTANCE, AND ABSORPTANCE OF COTTON (GOSSYPIUM HIRSUTUM) LEAVES,
Agricultural Research Service, Weslaco, Tex.
For primary bibliographic entry see Field 2I.
W76-06794

7C. Evaluation, Processing and Publication

APPLICATIONS OF LINEAR TIME SERIES MODELS AND STEPWISE REGRESSION MODELS TO SELECTED WATER QUALITY DATA ON THE CONNECTICUT RIVER,
Massachusetts Univ., Amherst. School of Health Sciences.
For primary bibliographic entry see Field 5B.
W76-06157

WATER INFORMATION SYSTEMS CATALOG.
Minnesota Water Resources Council, St. Paul. Water and Related Land Resources Information Systems Subcommittee.
For primary bibliographic entry see Field 10C.
W76-06256

REMOTE SENSING OF RESOURCES IN ARID LANDS,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 7A.
W76-06260

ATLAS OF ARIZONA.
Arizona Information Press, Yuma. 1976. 49 p. S. Bahre, editor.

Descriptors: *Maps, *Arizona, *Groundwater, *Drainage basins, *River flow, *Precipitation(Atmospheric), Data collections, Rivers, Water resources, Resources, Temperature, Hydrologic data, Regional analysis, Climates, Vegetation, Geology, Soils, Geomorphology, Land use, Land ownership, Irrigated land, Recreation, Bibliographies.

This atlas provides a graphic representation of the resources of Arizona. It contains maps of the state's rainfall, drainage areas, river flow, selected groundwater wells, average temperatures, climate, vegetation, general geology, soils, relief, physiographic cross sections, land ownership, and land utilization including crop distribution and irrigated areas, the Central Arizona Project, and recreational areas. An emphasis is placed on maps that are readable by all segments of society. Also included is a bibliography of Arizona maps. (Robinett-Arizona)
W76-06263

AN APPROACH TO A WATER QUALITY INDEX FOR CANADA,
Department of the Environment, Ottawa (Ontario). Science Policy Branch.
For primary bibliographic entry see Field 5G.
W76-06272

DATA COLLECTION SYSTEMS AND THEIR IMPACT ON THE FUTURE DEVELOPMENT OF HYDROLOGY,
Department of the Environment, Reading (England). Water Data Unit.
For primary bibliographic entry see Field 7A.
W76-06277

FLOOD PLAIN INFORMATION: NORTH FORK ST. LUCIE RIVER, ST. LUCIE COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06282

FLOOD PLAIN INFORMATION: UVAS-CARNADERO CREEK, PAJARO RIVER TO UVAS RESERVOIR, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-06283

FLOOD PLAIN INFORMATION: STILL AND MAD RIVERS, TOWN OF WINCHESTER, CONNECTICUT.
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W76-06284

FLOOD PLAIN INFORMATION: COASTAL AREAS, SARASOTA COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06285

COMPUTERIZED MONTHLY REPORTS, COST-EFFECTIVE ALTERNATIVE,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
F. A. DiGiano, R. J. DuPuis, and P. J. Williams.
Water and Sewage Works, Vol. 122, No. 12 p 49-53, December, 1975. 5 fig, 2 tab.

Descriptors: *Waste treatment, Treatment facilities, Waste water treatment, Monitoring, Costs, *Computer programs.
Identifiers: Pilot tests, Cost-effectiveness.

An optical scanning form and computer program, DTECTR (Diagnostic Testing of Efficiency by Computerization of Treatment Reports), have been developed to record, review, evaluate and store monthly operational data from waste water treatment plants. Operators at eight waste treatment plants in Massachusetts will soon participate in a pilot testing program of DTECTR. The computer program will evaluate plant operations rapidly, store data, make the operational data easily accessible to engineers and regulatory agencies, provide flexibility for expansion of data evaluations, and reduce staff time normally spent compiling such information. The system, developed by the University of Massachusetts Division of Water Pollution Control, includes an optical scanning form to be filled out by the plant operator. Space is provided for recording the following daily data: rain, flow, sludge recycle, dissolved oxygen, pH, chlorine residual, settleable solids, total coliform, fecal coliform, phosphorus and nitrogen in final effluent, suspended solids, BOD, and sludge settleability. Estimates of cost indicate that implementation of DTECTR by one state regulatory agency would result in a cost of $341 per month in contrast to $600 per month as required for present staff data analysis. (Loustau-FIRL)
W76-06300

FLOOD PLAIN MAPPING,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2E.
W76-06312

FULL AUTOMATION GOAL OF WATER RECLAMATION PLANT,
Brown and Caldwell, Inc., Walnut Creek, Calif. Process Control Div.
For primary bibliographic entry see Field 5D.
W76-06337

FLOOD PLAIN INFORMATION: COASTAL AREAS, ST. LUCIE COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06354

FLOOD PLAIN INFORMATION: VAN DUZEN RIVER, HUMBOLT COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-06355

FLOOD PLAIN INFORMATION: SAN TIMOTEO CREEK, VICINITY OF LOMA LINDA, SAN BERNARDINO COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-06356

FLOOD PLAIN INFORMATION: UPPER ST. VRAIN CREEK, VOLUME IV, BOULDER COUNTY, COLORADO.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-06357

FLOOD PLAIN INFORMATION: SALMON BROOK, EAST BRANCH AND WEST BRANCH, GRANBY AND E. GRANBY, CONNECTICUT.
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W76-06358

FLOOD PLAIN INFORMATION: CYPRESS CREEK, ORANGE COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06359

RESEARCH PROJECTS IN GLACIOLOGY - 1974,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W76-06368

WATER QUALITY DATA ALBERTA 1961 - 1973.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Quality Branch.
1975. English and French language versions.

Descriptors: *Water quality, *Data collections, *Physical properties, *Biological properties, Water, Oxygen, Nitrogen, Calcium, Methodology, Alkaline water, Heavy metals, *Canada.
Identifiers: *Alberta.

Tables on water quality data in Alberta from 1961 to 1973 are presented. This report is one of a series covering the major regions of Canada. These compilations of approximately 10 years data are an extension of the water survey reports of the industrial water resources of Canada, a monitoring program which began in 1947. (Environment Canada)
W76-06374

SEDIMENT DATA, CANADIAN RIVERS 1972.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
Inland Waters Directorate, Water Survey of Canada, 1975, 328 p.

Descriptors: *Sediments, *Rivers, *Data collections, *Canada, Reservoirs, Canals, Erosion, Hydrology, Geomorphology, Streamflow, Drainage, Ditches, Fish, Habitats.

Tables of sediment data on Canadian rivers are presented. These tables contain data on streamflow, daily suspended sediment discharges, daily mean suspended sediment concentration, particle-size distribution of suspended sediment, particle-size distribution of bed load, particle-size distribution of bed material, and water temperature. (Environment Canada)
W76-06376

SURFACE WATER DATA, REFERENCE INDEX, CANADA 1975.
Canada Centre for Inland Waters, Burlington (Ontario); and Department of the Environment, Ottawa (Ontario). Water Resources Branch.
Surface Water Data, 1975, 276 p. English and French language versions.

Descriptors: *Surface waters, *Surveys, *Data collections, *Canada, Rivers, Sediments, Stations, Lakes, Drainage area, Hydrometry, Gaging stations, Telemetry, Temperature, Codes, Collections.

Hydrometric surveys are conducted by the Water Survey of Canada under various agreements with the provinces and territories. The main body of this index is a tabulation of stations showing station number and name, drainage area, gauge location, discharge records, type of gauge, operation schedule, and remarks. The names of rivers and lakes for which data are available are given in a station number index and an alphabetical index. (Environment Canada)
W76-06377

A METHOD FOR ESTIMATING SNOWFALL AMOUNTS,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 2C.
W76-06408

CLASSIFICATION OF WETLANDS VEGETATION USING SMALL SCALE COLOR INFRARED IMAGERY,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 2L.
W76-06411

MODELING TECHNIQUES FOR GROUNDWATER EVALUATION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2F.
W76-06413

A PRACTICAL MONTHLY OPTIMUM OPERATIONS MODEL,
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office; and Bureau of Reclamation, Sacramento, Calif. Water and Power Control Div.
For primary bibliographic entry see Field 4A.
W76-06436

FLOOD-PRONE AREAS OF GADSDEN COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
R. P. Rumenik, C. A. Pascale, and D. F. Tucker.
Water-Resources Investigations 31-75, 1975. 1 sheet, 4 fig, 1 tab, 5 ref.

Descriptors: *Flood profiles, *Maps, *florida, Flood data, Flood peak, Flood discharge, Flood recurrence interval, Flood plains, Hydrologic data, Flood damage, Flood control.
Identifiers: Gadsden County(Fla).

The map of Gadsden County, Fla., provides a generalized reference for individuals interested in land use and development, for agencies formulating zoning regulations, and for insurance companies. The 100-year flood elevation is used for the national standard as the degree of protection needed when developing or considering development in flood-prone areas. Major flooding in Gadsden County occurred three times in less than 30 years. The most recent major flood was in September 1969 when more than 20 inches of rain fell in the Quincy-Havana area during a 3-day period. The maximum rainfall of record occurred at Quincy on September 21 when 10.87 inches of rain fell in six hours. Although no loss of life resulted from the flood, considerable damage did occur to cottages, mobile homes, roads, and bridges as flood levels exceeded the 100-year flood on most major streams in the county. Examples of flooding on the Little River at U. S. Highway 90 and the Ochlockonee River at State Highway 20 are shown. U. S. Highway 90 remained closed to traffic nearly 36 hours owing to structural damage to the Little River bridge. (Woodard-USGS)
W76-06443

THE LOWER WILCOX AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
E. H. Boswell.
Water-Resources Investigations 60-75 (open-file report), February 1976. 3 sheets, 16 fig, 3 tab, 1 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *Mississippi, Hydrogeology, Water utilization, Water supply, Groundwater recharge, Withdrawal, Maps, Water level fluctuations, Projections.
Identifiers: *Lower Wilcox aquifer(Miss).

This 'atlas', the second in a series, describes the character, the potential, and the extent of development of the lower Wilcox aquifer in Mississippi. Sediments composing the Wilcox Group are exposed in a curving belt that extends from Lauderdale County to Tippah County. In much of the

area where the lower Wilcox aquifer contains fresh water, all deeper aquifers are saline. Although minor aquifers occur in the middle and upper parts of the Wilcox Group, the Meridian-upper Wilcox aquifer is the next shallower extensive source for large supplies of groundwater. The largest withdrawals of water from the lower Wilcox are made in Lauderdale County where nearly 7 mgd is plumped (1975). The total production from the aquifer in Mississippi in 1975 was about 16 mgd and was distributed over 25 counties. The water is mostly of the sodium bicarbonate type. The dissolved-solids concentration is very low in the outcrop area, and the rate of increase in mineralization with depth is small in most of the area. Chloride is likely to exceed 200 mg/l only when the dissolved-solids concentration exceeds 700 mg/l. (Woodard-USGS)
W76-06444

THE MIOCENE AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
R. Newcome, Jr.
Water-Resource Investigations 46-75, December 1975. 3 sheets, 12 fig, 3 tab, 15 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Well data, *Water quality, *Mississippi, Hydrologic data, Hydrogeology, Alluvial aquifers, Water wells, Water yield, Water utilization, Groundwater recharge, Water analysis, Chemical analysis, Water temperature.
Identifiers: *Miocene aquifer system(Miss).

This report on the Miocene aquifer system in Mississippi is the first in a series dealing specifically with the statewide occurrence of individual aquifer systems. Most of the southern half of Mississippi is underlain by a series of irregular and locally lenticular sand and clay beds of Miocene age. Southwest of a line from Warren County on the west through Wayne County on the east, these sediments form a wedge that thickens gulfward and has its base about 5,500 ft below sea level at the southern tip of Hancock County. The beds dip gulfward at 30 to 100 ft/mi, the rate of dip being least in the near-surface zone. The Miocene aquifer system is the largest potential source of groundwater supplies in the State. In the 17,000 sq mi area of its occurrence it is currently tapped for about 120 Mgal/d, slightly more than one-fourth of the groundwater withdrawn in Mississippi for uses other than irrigation. Only the upper few hundred feet of the system have been significantly developed, and many thick aquifers remain unapped. The quality of the water is generaly good, he only substantial problem being excessive iron n places. (Woodard-USGS)
W76-06445

RAINFALL-RUNOFF DATA FROM SMALL WATERSHEDS IN COLORADO, OCTOBER 1971 THROUGH SEPTEMBER 1974,
Geological Survey, Denver, Colo.
G. L. Ducret, Jr., and H. E. Hodges.
Colorado Water Resources Basic-Data Release No 38, Colorado Water Conservation Board, Denver, 1975. 540 p, 2 fig, 3 tab, 12 ref.

Descriptors: *Rainfall-runoff relationships, Small watersheds, *Colorado, *Basic data collections, Stream gages, Rain gages, Streamflow, Computer programs.

All significant rainfall-runoff data collected in Colorado small watersheds from October 1971 through September 1974 by a network of gages are presented. Detailed records of rainfall and stream age are collected at each station by the operation f two digital recorders which code the data on 16-hannel paper tape at 5-minute intervals. Use of a ngle timer provides for simultaneous actuation of oth recorders. Detailed station-description infor-ation is included for every station in the study. A mputer program developed by the U.S. Geological Survey uses the stage-discharge relation at a gage to convert time and stage data into a printout of time versus discharge. Because the intakes to the gage wells are generally located above the bottoms of the stream channels, there is a flow rate at each station below which the discharges must be estimated to complete the hydrographs. (Woodard-USGS)
W76-06446

HYDROLOGIC DATA FOR THE IDAHO NATIONAL ENGINEERING LABORATORY SITE, IDAHO, 1971 TO 1973,
Geological Survey, Idaho Falls, Idaho.
For primary bibliographic entry see Field 5B.
W76-06447

WATER RESOURCES OF THE THRUST BELT OF WESTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
G. C. Lines, and W. R. Glass.
For sale by USGS, Reston, Va. 22092; price $2.00 per set. Hydrologic Investigations Atlas HA-539, 1975. 3 sheets, 38 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resource, *Water quality, *Wyoming, Water supply, Water utilization, Water yield, Consumptive use, Streamflow, Aquifers, Maps, Hydrographs, Contours, Thermal springs.
Identifiers: *Thrust belt(Western Wyo).

This atlas report describes the results of one of a series of water-resources reconnaissance studies of large areas in Wyoming by the U.S. Geological Survey in cooperation with the Wyoming State Engineer. The purposes of the study are to obtain a general knowledge of the occurrence, availability, and quality of groundwater and to summarize flow characteristics and chemical quality of water in major streams in the thrust belt of western Wyoming. The thrust belt is an elongate, nearly rectangular area of about 5,300 sq mi in the Middle Rocky Mountain physiographic province. The largest use of water in the area is for irrigation of alfalfa, grass hay, and pasture to complement livestock grazing on the vastly larger areas of forest and range land. In that part of the Bear River basin that is in Wyoming, an estimated 58,700 acres were irrigated in 1970 (Hunter and others, 1971); only about 2,000 acres of this total was irrigated with water from wells. Industrial water use in 1970 is estimated at 6 mgd with about 80 percent of the water derived from surface-water sources. Approximately two-thirds of the estimated 18,000 people that lived in the study area in 1970 were served by municipal water supplies in Afton, Cokeville, Evanston, Kemmerer, Jackson, and Thayne. Estimated use in 1970 by these municipal supplies was 5.4 mgd. Three areas of thermal-water discharge are known in the area. (Woodard-USGS)
W76-06448

PRELIMINARY HYDROGRAPHY AND HISTORIC TERMINAL CHANGES OF COLUMBIA GLACIER, ALASKA,
Geological Survey, Tacoma, Wash.
A. Post.
For sale by USGS, Reston, Va., 22092, price $1.75 per set. Hydrologic Investigations Atlas HA-559, 1975. 3 sheets, 14 ref.

Descriptors: *Glaciers, *Hydrography, *Mapping, *Movement, *Alaska, Discharge(Water), Climatology, Data collections, Monitoring, Aerial photography, Geomorphology.
Identifiers: *Columbia Glacier(Alaska), Historic terminal changes.

Data on 3 sheets of maps show that for more than 70 years Columbia Glacier's terminus in Alaska has been virtually stable, with frequent temporary advances being balanced retreats of the same magnitude. This stability is in marked contrast to other glaciers in the area, most of which have thinned and retreated during this interval, the only other notable exceptions being tidal glaciers which have previously made large-scale drastic retreats and which are currently advancing. Columbia Glacier's extended position and advances in recent decades over areas not glaciated for more than 9,000 years (J. H. Mercer, written commun., 1975) are anomalous. Very large embayments which form some years in the glacier's terminus cliff may present a serious hazard to the glacier's continued stability. Drastic retreat with associated increased iceberg discharge could occur within a few years should the glacier retreat from the shoals. These fluctuations at the terminus and changes in thickness in other parts of the glacier are being carefully monitored in order to predict the glacier's future stability. (Woodard-USGS)
W76-06449

PHYSICAL AND CLIMATIC CHARACTERISTICS ALONG KANSAS STREAMS,
Geological Survey, Lawrence, Kans.
C. V. Burns, D. V. Maddy, P. R. Jordan, and J. M. McNellis.
Kansas Water Resources Board Topeka, Streamflow Characteristics Technical Report No 13, January 1976. 41 p, 8 ref.

Descriptors: *Physical properties, *Channel morphology, *Climatic data, *Streams, *Kansas, Data collections, Streamflow, Drainage area, Water temperatures, Hydrologic cycle, Soil properties, Vegetation, Trees, Information retrieval, Computer programs.

Physical and climatic characteristics of streams are presented from data collected at gaging stations and other selected sites in and adjacent to Kansas. Examples of the 30 characteristics listed include main channel length, percent timber area, and 50-year 24-hour rainfall. Data are included for about 600 locations. Some of the data have been published in numerous reports some have remained in the files, and some have been updated as more information has become available. Data available have been compiled as part of a cooperative program between the Kansas Water Resources Board and the U.S. Geological Survey. The computer program (named WIDSAR) is written in Fortran IV and consists of a main program with two subroutines that control the processing and production of the tables desired. (Woodard-USGS)
W76-06450

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1975,
Geological Survey, Doraville, Ga.
Water-Data Report GA-75-1, February 1976. 368 p, 4 fig, 5 tab, 32 ref.

Descriptors: *Basic data collections, *Surface waters, *Georgia, *Streamflow, *Water quality, Sediment transport, Gaging stations, Flow rate, Sampling sites, Water analysis, Chemical analysis, Water temperature, Lakes, Reservoirs, Water levels, Hydrologic data.

Water resources data for the 1975 water year for Georgia consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs. This report contains discharge records for 91 gaging stations; stage only records for one gaging station; stage and contents for 16 lakes and reservoirs water quality for 16 continuous stations and 78 periodic stations. Also included are 99 crest-stage partial-record stations and two low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Georgia. (Woodard-USGS)

W76-06451

GEOLOGIC AND WATER-SUPPLY REPORTS AND MAPS--WYOMING, JULY 1975,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 10C.
W76-06456

GROUND-WATER IN NEW MEXICO, 1973,
Geological Survey, Albuquerque, N. Mex.
J. D. Hudson.
New Mexico State Engineer, Santa Fe, Basic-Data Report, 1975. 99 p, 32 fig, 62 tab, 47 ref.

Descriptors: *Groundwater resources, *Water level fluctuations, *Observation wells, *Basic data collections, *New Mexico, Well data, Aquifers, Precipitation(Atmospheric), Hydrographs.

Water levels were measured in a network of about 1,600 observation wells in 35 areas located within seven of the nine major surface-water drainage basins in New Mexico. Measurements were made in January or February 1974 and reflect water-level changes with measurements made in January or February 1973. Maps showing observation-well locations and water-level changes for 1973 are included for most areas. The water-level data are used by the U.S. Geological Survey and the State Engineer of New Mexico in evaluating the groundwater resources of the State. (Woodard-USGS)
W76-06460

SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE -GROUNDWATER USAGE - PHASE 2,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-06551

DETERMINATION OF R-Z RELATIONSHIPS FOR WEATHER RADAR USING COMPUTER OPTIMIZATION TECHNIQUES,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 2B.
W76-06604

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 2B.
W76-06606

OPTIMAL SAMPLING AND OBJECTIVE ANALYSIS,
Eddy (Amos), Inc., Norman, Okla.
For primary bibliographic entry see Field 2B.
W76-06609

A GENERALIZED STREAMFLOW SIMULATION SYSTEM, CONCEPTUAL MODELING FOR DIGITAL COMPUTERS,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 2A.
W76-06634

CORRELATION OF DUAL-CHANNEL AIRBORNE IR DATA WITH SOIL MOISTURE MEASUREMENTS,
Development and Resources Transportation Co., Silver Spring, Md.
For primary bibliographic entry see Field 2G.
W76-06660

FORTRAN GRAPHICS PROGRAMS FOR PHYSICAL OCEANOGRAPHIC AND TIME SERIES DATA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
W. P. Kramer, and R. H. Weisberg.
Marine technical report 46, (1975), 92 p. NSF Grant OCD74-01739 401.

Descriptors: Computers, *Computer programs, *Data collections, Data processing, Data storage and retrieval, Charts, Statistics, *Time series analysis, Oceanography.
Identifiers: FORTRAN, *Physical oceanographic data, Time series data.

A group of FORTRAN programs written to display time series data, X-Y data, and the results of time series analysis are documented. Separate programs are used to plot variables on any combination of linear and logarithmic (base 10) axes. Originally written to plot physical oceanographic data, these programs may be used in wider applications due to their flexibility. Parameters which determine plot size, numbering and labelling of axes are user supplied variables. The data storage device and format are also supplied at execution time. All of these programs are stored in compiled form for use at URI. Listings are supplied in the appendices for other users. (NOAA)
W76-06661

SYNTHESIS OF BASIN RESPONSE WITH INADEQUATE DATA,
Osmania Univ., Warangal (India). Regional Engineering Coll.
For primary bibliographic entry see Field 2A.
W76-06675

METHOD FOR REDUCING SINGLE DISCHARGE MEASUREMENTS TO THE AVERAGE DISCHARGE OF THE LOW-FLOW PERIOD,
For primary bibliographic entry see Field 2E.
W76-06679

PUMPING TEST ANALYSIS WHEN PARAMETERS VARY WITH DEPTH,
Birmingham Univ., (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-06687

8. ENGINEERING WORKS

8A. Structures

PREVENTION AND CONTROL OF CULVERT ICING, SUMMARY REPORT ON STUDIES FY 1966-70,
Cold Regions Research and Engineering Lab., Hanover, N. H. Experimental Engineering Div.
K. L. Carey, R. W. Huck, and D. A. Gaskin.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-010 328, $5.00 in paper copy, $2.25 in microfiche. Special Report 224, April 1975. 79 p, 46 fig, 7 tab, 10 ref, 2 append.

Descriptors: *Ice, *Culverts, *Highways, *Alaska, Roads, Pipes, Channels, Channel improvement, Conduits, Drainage, Flow, Flow resistance, Flood control, Freezing, Thawing, Heating.
Identifiers: Electrical heating cables, Channel covers.

U.S. Army Cold Regions Research and Engineering Laboratory field inspections and data collection on icing conditions and methods of control prior to 1966 provided background to the overall study. A literature survey, covering primarily American and Russian experience, and a survey by questionnaire of highway maintenance forces in Alaska provided background to a field study of icing prevention and control covering four winter seasons in Alaska. Climatological, culvert temperature, ground temperature and hydrologic data were collected at Grenac, Steele and Flume Creeks near Fairbanks, Alaska, to extend understanding of icing phenomena. Field trials were conducted at Bear Creek, Grenac Creek, Steele Creek, Moose Creek and Gakona Spring to test three expedient techniques for controlling icing: electric heating cables, channel improvement and channel covers. Electric heating cables and channel deepening proved to be very promising for icing control, and improved installation and operating procedures for electric heating cables were developed during the study. The usefulness of channel covers proved to be rather restricted. Ground temperature data were collected from an array of thermocouples beneath and adjacent to a 24-in corrugated metal culvert at Mile 15 on the Elliott Highway to study the thermal regime surrounding an ice-flooded culvert. These data demonstrated that culvert ends were the critical regions of heat loss. (Sims - ISWS)
W76-06193

THEORY OF WEIRS,
Indian Inst., of Science, Bangalore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-06416

A STUDY TO ASSESS GOALS FOR USES AND MANAGEMENT OF SHORELINE AND IMPLICATIONS FOR CORPS OF ENGINEERS PROGRAMS.
Coastal Zone Resources Corp. Wilmington, N. C.
For primary bibliographic entry see Field 6B.
W76-06418

INFLATABLE WATER-RETAINING BARRIER,
Pneumatiques, Caoutchouc Manufacture et Plastiques Kleber-Colombes (France), (Assignee).
J. V. Ganzinotti.
U.S. Patent No. 3,928,980, 5 p, 12 fig, 6 ref; Official Gazette of the United States Patent Office Vol 941, No 5, p 2029, December 30, 1975.

Descriptors: *Patents, *Barriers, *Engineering structures, *Dams, *Diversion structures, Rivers, Channels, Flexibility.
Identifiers: Inflatable barriers.

An inflatable water-retaining barrier is made up of one or more flexible membranes forming the enclosure and are used to block a watercourse such as a river. The enclosures are all fastened to a rigid member which extends along the whole length of the enclosures and is intended to be supported by the bank of the water course. The rigid member such as a metal bar or tube prevents the enclosure from deforming longitudinally. Mechanical stresses exerted on the barrier are transferred to the rigid member and thus to the banks. To install such a barrier, it is sufficient to inflate it with air until it floats, to position it on the river upstream of the abutments, to let it be carried along by the current under guidance until the rigid member rests against the abutments or banks and then to let out the air and to fill it with water until it sinks. It is likewise very simple to remove the barrier. The water contained in the inflatable enclosure is expelled and replaced by air, which buoys it and the rigid member up to the surface of the water. (Sinha - OEIS)
W76-06462

8B. Hydraulics

WASTEWATER DISPOSAL BY SUBMERGED MANIFOLDS,
Miljoplan, Hovik (Norway). Water Pollution Section.
For primary bibliographic entry see Field 5B.
W76-06387

MENABREA'S NOTE ON WATERHAMMER: 1858,
Aberdeen Univ. (Scotland). Dept. of Engineering.
A. Anderson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY1, Proceedings Paper 11831, p 29-39, January 1976. 1 tab, 27 ref, 3 append.

Descriptors: *Hydraulics, *Hydraulic trasients, *Closed conduits, *Pressure conduits, Pipe flow, *Water hammer, Flow, *History, Fluid mechanics.
Identifiers: *Energy analysis.

The earliest analysis of waterhammer is frequently attributed to Jules Michaud in 1878, but in 1858 the Italian engineer, L.F. Menabrea, published a short note on the calculation of water pressures. This little known contribution is, for its time, a remarkable and innovative study, introducing the technique of energy analysis and describing the phenomenon with singular clarity. As it thus appears to deserve wider recognition in the history of waterhammer, the note was translated and an explanatory introduction was provided. The introduction was intended: (1) to demonstrate how close Menabrea came to the derivation of the formula generally attributed to Joukowsky, (2)to pinpoint the errors and failures in his analysis, and (3) to examine briefly the reception at the turn of the century of the ideas he first proposed some 40 years earlier. (Morris - ISWS)
W76-06388

SKIN FRICTION IN UNSTEADY LAMINAR PIPE FLOW,
Universidad Tecnica del Estado, Santiago (Chile).
M. F. Letelier, and H. J. Leutheusser.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY1, Proceedings Paper 11867, p 41-56, January 1976. 10 fig, 9 ref, 2 append.

Descriptors: *Hydraulic transients, *flow resistance, *Boundary processes, *Closed conduits, Head loss, Flow, *Pipe flow, Analysis, Laminar flow, Unsteady flow.
Identifiers: Flow patterns, *Friction coefficient, Oscillation, Time dependence.

The routine approach toward solving problems of unsteady pipe flow utilizes either the concept of a constant friction coefficient, or the model of quasi-steady flow. These two hypotheses were tested using exact analytical solutions and corroborating experimental evidence for two cases of time-dependent laminar pipe flow: (1)The establishment of Poiseuille flow and (2)U-tube oscillations. It was shown that neither of the simplifying assumptions corresponds to reality, and that both tend to severely underestimate the frictional resistance. It was suggested that similar conclusions may also pertain to unsteady turbulent pipe flow. (Morris - ISWS)
W76-06389

WAVE FORCES ON BOTTOM-MOUNTED LARGE-DIAMETER CYLINDER,
Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
C. J. Garrison, F. H. Gehrman, and B. T. Perkinson.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 101, No. WW4, Proceedings Paper 11699, p 343-356, November 1975. 4 fig, 10 ref, 2 append.

Descriptors: *Harbors, *Hydrodynamics, *Pipelines, *Waves(Water), *Dynamics, Testing, Dimensional analysis, Pressure, Regression analysis, Strain gages, Uplift pressure.
Identifiers: *Underwater pipeline, Inertia force, Wave height.

A systematic series of tests were conducted to determine the horizontal and uplift forces acting on a bottom-mounted horizontal circular cylinder. The maximum value of horizontal force tended to vary linearly with wave height for the test range of 15 to 120 for the ratio of the square of wave period to water depth. The uplift forces comprise two components, dynamic lift and an inertia part. The latter can be represented by Froude-Krilov force. The maximum uplift force generally occurred at the wave trough where the inertial and dynamic components are additive. The uplift force is primarily attributable to the dynamic lift and is dependent on the lift coefficient which is in turn dependent on the relative magnitude of the particle displacement. As the wave height increases, a point is reached where gross flow separation and corresponding reduction in lift coefficient occurs. (Singh-ISWS)
W76-06395

STATISTICS OF RANDOM WAVE FIELD,
Worley Engineering Inc., Houston, Tex.
K. Pajouhi, and C. C. Tung.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 101, No. WW4, Proceedings Paper 11734, p 435-449, November 1975. 5 fig, 10 ref, 2 append.

Descriptors: *Coastal engineering, *Gravity waves, *Free surfaces, *Probability, *Fluid mechanics, Statistical methods, Pressure, Velocity, Analytical techniques, Interfaces.
Identifiers: *Random wave field, Dynamic pressure, Spectrum analysis.

In the case of random sea waves, the statistical properties of fluid motion are quite different for the cases with and without the free-surface fluctuations phenomenon. Expressions of the probability density function, covariance function and sprectrum of dynamic pressure, and vertical and horizontal components of fluid particle velocity in a random wave field were derived with due consideration given the free surface fluctuations phenomenon. The waves were assumed to be unidirectional, stationary, Gaussian, and in deep water. An incompressible inviscid fluid and irrotational motion were assumed. The study indicated : (1) dynamic pressure and fluid particle velocities are all non-Gaussian, (2) dynamic pressure and horizontal velocity possess nonzero means and are skewed, (3) approximate spectra of dynamic pressure and velocity components compare favorably with exact solutions, and (4) the effects of free surface fluctuations on all the quantities examined are most pronounced for points above and around the mean water level. (Singh-ISWS)
W76-06397

LARGE WAVE TANK TESTS OF RIPRAP STABILITY,
Coastal Engineering Research Center, Fort Belvoir, Va.
J. P. Ahrens.
Available from the National Technical Information Service, Springfield, Va. 22161 as AD-A012 792, $4.00 in paper copy, $2.25 in microfiche. Technical Memorandum No. 51, May 1975. 41 p, 21 fig, 6 tab, 10 ref, append.

Descriptors: *Slope protection, *Slope stability, *Slope stabilization, Waves(Water), Riprap, Embankments, Banks, Slopes, Laboratory tests, Coastal engineering, Bank protection, Bank stabilization.
Identifiers: *Large wave tank tests, *Riprap stability, Riprap weight, Wave period, Breaker characteristics, Riprap layer thickness, Filter stone size.

Tests of riprap stability under wave attack were conducted at prototype scale in the large wave tank at the U.S. Army Coastal Engineering Research Center (CERC). Wave heights ranging from 1.4 to 6 feet and wave periods ranging from 2.8 to 11.3 seconds were used. Three embankment slopes, 1 on 2.5, 1 on 3.5, and 1 on 5, were tested. The riprap stone was a diorite placed on the embankments by dumping. The median stone weights of the riprap ranged from 27 to 120 pounds. The study showed that wave period, because of its influence on breaker characteristics, has a significant effect on riprap stability. Wave conditions which produce the lowest riprap stability were predictable and were associated with a collapsing-type breaker. For the most dangerous wave conditions, the average stability coefficient was 2.70 for a 1 on 2.5 slope, 2.36 for a 1 on 3.5 slope, and 2.11 for a 1 on 5 slope. (Lee-ISWS)
W76-06410

ADVANCES IN HYDROSCIENCE, VOLUME 10-1975.
Academic Press, New York, New York, 1975. 414 p.

Descriptors: *Groundwater, *Model studies, *Tides, *Tidal waters, *Porous media, *Heat transfer, *Weirs, *Flow control, Theoretical analysis, Mathematical models, Aquifers, Hydraulics, Flow measurement, Flow characteristics, Equations, Geothermal studies, Numerical analysis, Subsurface waters, Oceans, Aquifer characteristics, Water measurement.

This volume contains four relatively long articles. (1) 'Modeling Techniques for Groundwater Evaluation' were outlined under the groups of analogs, analytical and numerical techniques, and sand tank models. Regional groundwater resource evaluation was emphasized. (2) 'Tidal Theory and Computations' dealt with tidal theory developed since 1964 for analysis of tides, tidal equations, and tidal computations. (3) 'Hydrothermal Convection in Saturated Porous Media' summarized the theories involved. The subject matter will be of great importance to problems such as groundwater pollution, exploration of geothermal energy and oil reservoirs, and constructions in cold regions. (4) 'Theory of Weirs' provides an advanced theoretical analysis of the hydraulics of many types of weirs used for flow measurement and flow control. This analysis will benefit designers and users of such hydraulic structures for water resources development. (See W76-06413 thru W76-06416) (Humphreys-ISWS)
W76-06412

MODELING TECHNIQUES FOR GROUNDWATER EVALUATION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2F.
W76-06413

TIDAL THEORY AND COMPUTATIONS,
Hydraulic Dept. of Deltaworks, The Hague (Netherlands).
For primary bibliographic entry see Field 2L.
W76-06414

HYDROTHERMAL CONVECTION IN SATURATED POROUS MEDIA,
Bordeaux-1 Univ., Talence (France).
For primary bibliographic entry see Field 2F.
W76-06415

THEORY OF WEIRS,
Indian Inst., of Science, Bangalore. Dept. of Civil Engineering.
N. S. L. Rao.
In: Advances in Hydroscience, Volume 10-1975. Academic Press, New York, New York, p 309-406, 1975. 60 fig, 7 tab, 192 ref.

Descriptors: *Weirs, *Flow control, *Flow measurement, *Discharge(Water), *Hydraulic structures, Theoretical analysis, Equations, Shape, Flow characteristics, Flow rates, Discharge coefficient, Measurement, Overflow, Open channels, Hydraulics, Water measurement, Flowmeters, Spillway crests, Flumes, Velocity, Profiles.
Identifiers: *Weir characteristics.

The term weir includes structures such as the depression in the side of a tank, a reservoir, or a channel for passing surplus water, and overflow structures such as a spillway for a dam. This paper involved only the hydraulics of weirs and was limited to flow measurement and control aspects. Specific subject area covered included: (1)channel conditions, weir characteristics, and liquid properties affecting flow over weirs; (2)rectangular and nonrectangular sharp-crested or thin plate weirs; (3)different cross-sectional profile shapes and different longitudinal profile shapes for broad-crested or finite crest width weirs; (4)terminal weirs; (5)end depth characteristics in rectangular and nonrectangular channels for zero height weirs; (6)theorems on proportional weirs, and proportional weirs for flow measurement and flow control; (7)throated flumes with and without humps for flow measurement; (8)v-shaped and labyrinth weirs; and (9)the effects of error, sensitivity, and standardization procedures of accuracy of measurements. The results of this study presented in tables, graphs, and equations will benefit designers and users of weirs for water resources development. (See also W76-06412) (Humpreys-ISWS)
W76-06416

ANALYSIS AND INTERPRETATION OF LITTORAL ENVIRONMENT OBSERVATION (LEO) AND PROFILE DATA ALONG THE WESTERN PANHANDLE COAST OF FLORIDA,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 2L.
W76-06637

FIELD STUDIES OF THE THERMAL PLUME FROM THE D. C. COOK SUBMERGED DISCHARGE WITH COMPARISONS TO HYDRAULIC-MODEL RESULTS,
Argonne National Lab. Ill. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W76-06673

CONTROLLING RESERVOIR TRAP EFFICIENCY,
Agricultural Research Service, Columbia, Mo. North Central Watershed Center.
D. L. Rausch, and H. G. Heinemann.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 6, p 1105-1113, November-December 1975. 6 fig, 2 tab, 5 ref.

Descriptors: *Trap efficiency, Sedimentation, *Sedimentation rates, *Reservoir design, *Reservoir silting, *Regression analysis, *Spillways, Stratification, Water quality, Surface runoff, Storage, Storage capacity, Erosion, Sediment yield, Particle size, Dead storage, *Missouri.
Identifiers: Non-linear regression, Detention time, Bottom-withdrawal spillway, Siphon spillway, Sediment reduction.

Research on three reservoirs in central Missouri has shown that reservoir sedimentation trap efficiency is affected by the detention time of storm runoff and by factors governing sediment particle size. Decreasing the detention time can be done by discharging storm runoff from the reservoir with the use of a bottom-withdrawal spillway. With the bottom-withdrawal spillway, the clean water remains in the reservoir and floats above the density currents caused by storm runoff moving to the deepest part of the reservoir. (Terstriep-ISWS)
W76-06682

8C. Hydraulic Machinery

LONG-TERM OPERATION OF STORAGE HYDRO PROJECTS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-06434

PRELIMINARY ENGINEERING ANALYSIS, YUMA DESALTING PLANT.
Burns and Roe, Inc., Paramus, N. J.
For primary bibliographic entry see Field 3A.
W76-06547

THE ECONOMICS OF CONVERTING NATURAL GAS-POWERED IRRIGATION PUMPS TO ALTERNATE ENERGY SOURCES IN SOUTHEASTERN ARIZONA,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-06588

PRELIMINARY DESIGN OF A DIESEL-POWERED VAPOR-COMPRESSION PLANT FOR EVAPORATION OF SEAWATER,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 3A.
W76-06750

8D. Soil Mechanics

CALCULATING TEMPERATURE REGIME OF EARTH DAMS IN PERMAFROST REGIONS,
Moskovskii Inzhenerno-Stroitelnyi Institut (USSR). Dept. of Hydraulic Engineering Structures.
I.S. Moiseyev.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-010 826, $8.00 in paper copy, $2.25 in microfiche. CRREL Draft Translation 450, November 1974. 16 p, 7 fig, 5 ref. Translated from Gidrotekhnicheskiye Sooruzheniya (Hydraulic Engineering Structures), No. 29, p 281-293, 1959.

Descriptors: *Dams, *Earth dams, *Permafrost, *Arctic, Temperature, Measurement, Reservoirs, Thawing, Freezing, Frozen soils, Frozen ground, Cold regions, Structures.

One of the many features of earthfill dams in the regions of persistently frozen soils is the thermal regime in the body and base of the dam. After filling of the reservoir, part of the frozen earth dam will thaw slowly under the effect of water's heat, but after the passage of a certain time (depending on air temperature, temperature of water in the reservoir, material in dam body, and thickness of the permafrost layer) the thawing of the permafrost in the dam practically ceases. A steady state of temperature field sets in, in which the upper part of the dam will be thawed while the central and lower sections will be frozen. In the planning of these dams, it is necessary to establish the advancement of the interface between the thawed and the frozen zone in the period after the filling of the reservoir and the position of this boundary during a stationary state. The temperature fields within earth dams of various profiles at constant water temperatures in the reservoir and outside air can be calculated using equations presented. (Sims - ISWS)
W76-06191

IDENTIFICATION AND TREATMENT OF DISPERSIVE CLAY SOILS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
T. A. Haliburton, T. M. Petry, and M. L. Hayden.
July 1975. 14-06-D-7535.

Descriptors: *Clay soils, *Soil erosion, *Laboratory tests, Stabilization, Embankments, Earth dams, Cut slopes, *Erosion control, *Dispersion.
Identifiers: Chemical treatment(Soils).

A method was developed for physical testing for identification of potentially dispersive clay soil. In addition, the test was used to evaluate the effects of chemical treatment in reducing dispersive clay erosion potential. Previous research in soil science and soil engineering covering dispersive clay behavior was reviewed and previous methods for identification of dispersive clay behavior were discussed and evaluated. Based on the shortcomings of previous research, criteria for a physical identification test were developed, and the Physical Erosion Test, developed from these general criteria, was evaluated using 19 different soils from locations where dispersive erosion damage had occurred, plus three non-dispersive control soils. The Physical Erosion Test is believed to be a superior method, compared to other existing procedures, of identifying before the fact dispersive erosion problems, especially for artificially compacted earth structures. Hydrated lime, aluminum sulfate and sodium chloride were effective as chemical stabilizers to reduce dispersive clay erosion potential. (Bureau of Reclamation)
W76-06611

SOIL STABILIZATION FOR EROSION CONTROL,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W76-06639

STABILIZATION OF CLAY SOILS AGAINST EROSION LOSS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W76-06640

BUFFALO HARBOR DIKED DISPOSAL SITES: ENGINEERING PROPERTIES AND DRAINAGE CHARACTERISTICS,
State Univ. of New York Coll. at Buffalo.
For primary bibliographic entry see Field 5E.
W76-06666

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES, INVESTIGATION REPORT, PHELPS DODGE CORPORATION, MORENCI TAILINGS DAM, MORENCI, ARIZONA, VOLUME 2,
Wahler (W.A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-06669

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES. INVESTIGATION REPORT, KENNECOTT COPPER CORPORATION, MAGNA TAILINGS DAM, MAGNA, UTAH. VOLUME 3,
Wahler (W.A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-06670

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES. RECONNAISSANCE REPORT, VOLUME 5.
Wahler (W. A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-06672

8E. Rock Mechanics and Geology

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES. INVESTIGATION REPORT, KENNECOTT COPPER CORPORATION, CHINO LEACHING DUMP, SANTA RITA, NEW MEXICO, VOLUME 4,
Wahler (W. A.) and Associates, Palo Alto, Calif.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 077, $6.00 in paper copy, $2.25 in microfiche. Bureau of Mines OFR 50(4)-75, December 1974. 111 p, 14 fig, 1 tab, 15 ref, 2 append. Bu Mines S0110520.

Descriptors: *Waste dumps, *Sampling, *New Mexico, *Waste disposal, *Mining, Geology, Disposal, Leaching, Dams, Drilling, Testing, Piezometers, Rocks, Faults(Geologic), Earthquakes, Seismic studies.
Identifiers: *Mill tailings, *Disposal practices, *Santa Rita(NM), Dam stability, Open pit mine.

This report presented the results of a study of Kennecott Copper Corporation's Chino dump at Santa Rita, New Mexico, carried out as part of a research program conducted for the United States Department of the Interior, Bureau of Mines. The results of this study were to be used as background information -along with the results of studies on other selected sites and independent, but related, research -to advance the state-of-the-art of mine waste disposal technology and to begin the development of techniques, procedures, and criteria for the investigation, inspection, and review of existing and proposed mine waste embankments. The stability studies described were performed on only one cross section of the leach dump, utilizing data obtained from drilling, sampling, and testing which was limited in nature. Therefore it was not possible to evaluate the degree of safety or adequacy of the leach dump, and the information and data contained in the body of the report must be judged in that light. (See also W76-06669) (Roberts - ISWS)
W76-06671

8G. Materials

MEASUREMENT OF SMALL STRAIN-RATES OVER SHORT TIME PERIODS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Glaciology Div.
For primary bibliographic entry see Field 2C.
W76-06184

THE BEARING CAPACITY OF FLOATING ICE PLATES SUBJECTED TO STATIC OR QUASI-STATIC LOADS, A CRITICAL SURVEY,
Princeton Univ., N. J. Dept. of Civil and Geological Engineering.
A. D. Kerr.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-009 363, $4.00 in paper copy, $2.25 in microfiche. CRREL Research Report 333, March 1975. 43 p, 28 fig, 157 ref. ARPA DACA-70-C-0022.

Descriptors: *Ice, *Bearing strength, *Strength of materials, Mechanical properties, Stress, Pressure, Strength, Loads(Forces), Ice loads, Sea ice, Iced lakes, Rivers, Ice cover, Cold regions.
Identifiers: *Floating ice plates.

Field observations revealed that when a vehicle is small and relatively heavy it may break through the ice plate immediately after placement. In such cases, the plate response may be considered elastic up until failure. For relatively light vehicles, the ice plate deforms elastically at the instant of loading, but sustains the load. However, as time progresses, the ice plate continues to deform in creep, especially in the vicinity of the vehicle, and after a certain time interval the vehicle may break through the ice. The purpose of this report was to present a critical survey of the literature on the bearing capacity of floating ice plates. First, the various analytical attempts to determine the bearing capacity were reviewed. This was followed by a discussion of test data and their relation to the analytical results. The report concluded with a systematic summary of results, a discussion of observed shortcomings, and recommendations for needed investigations. (Sims-ISWS)
W76-06192

WATER-DISTRIBUTION-SYSTEM CORROSION CONTROL,
Indianapolis Water Co., Ind.
R. E. Trivers, J. F. Armacost, and J. A. Lee.
Journal of American Water Works Association, Vol. 66, No. 8, p. 453-455, August, 1974. 3 fig, 2 ref.

Descriptors: *Water distribution(Applied), *Corrosion control, *Films, *Distribution systems, Maintenance, *Indiana.

A corrosion control program has been undertaken by the Indianapolis (Ind.) Water Co., a water system consisting of 1820 miles of gray cast and ductile iron and 13 miles of reinforced concrete water mains. Two recent corrosion-related leaks have prompted action. The first step was to gain knowledge from corrosion specialists, through the Indiana Corrosion Society and Purdue University. To control such problems the limits of corrosion have to be found, soil tests are necessary before new construction, preventive measures must be incorporated into designs, and records of corrosion must be kept. Field testing equipment consists of a two man auger, vibroground in combination with a single probe, a high resistance voltmeter, and an AC ammeter. Lab equipment includes a pH meter, vibroground, and sodium azide-iodine solution to determine the existence of anaerobic sulphate-reducing bacteria. Field testing requires augering to 4.5 feet and collecting a sample to be analyzed in the lab. If corrosive conditions exist pipes are wrapped in 8-mil polythylene film which is economical to use. In some cases stray current from other utilities causes corrosion which then must be corrected. To determine the extent of corrosion on mains, test holes are dug and hydrostatic pressure tests are made. To date the recognition of corrosion has increased 6 to 16%, and 8 to 10% of new mains have been protected. (Smith - North Carolina)
W76-06276

METHOD FOR COLLECTING SCALE FORMATIONS IN WATER PIPES,
Key II Industries, Camarillo, Calif. (Assignee).
P. Centineo.
U.S. Patent No. 3,936,376, 3 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 943, No 1, p 337, February 3, 1976.

Descriptors: *Patents, *Scaling, *Mineral water, *Water utilization, *Water conservation, *Water yield improvement, Corrosion, Damages, Descaling, Pipes, Electrodes, Screens, Separation techniques, Electric fields.
Identifiers: Water pipes.

Conglomerations of charged ions of minerals in a water pipe system resulting from subjecting the water to an alternating electric field are effectively removed from the water flow path by providing two screens. The first screen is located normal to the flow path so that the water flows through the screen. The second screen is located in a chamber connected laterally to a water pipe section carrying the water flow upstream of the first screen. The first and second screens are charged positively and negatively respectively so that the first screen will repel conglomerations of minerals and the second screen will attract the minerals to collect them in the chamber. (Sinha - OEIS)
W76-06479

IDENTIFICATION AND TREATMENT OF DISPERSIVE CLAY SOILS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 8D.
W76-06611

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES, INVESTIGATION REPORT, PHELPS DODGE CORPORATION, MORENCI TAILINGS DAM, MORENCI, ARIZONA, VOLUME 2,
Wahler (W.A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-06669

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES. INVESTIGATION REPORT, KENNECOTT COPPER CORPORATION, MAGNA TAILINGS DAM, MAGNA, UTAH. VOLUME 3,
Wahler (W.A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-06670

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES. RECONNAISSANCE REPORT, VOLUME 5.
Wahler (W. A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-06672

FIBONACCI SEARCH FOR HIGH-YIELD WELL SITES,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-06686

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

WATER INFORMATION SYSTEMS CATALOG.
Minnesota Water Resources Council, St. Paul. Water and Related Land Resources Information Systems Subcommittee.
For primary bibliographic entry see Field 10C.
W76-06256

10C. Secondary Publication And Distribution

WATER INFORMATION SYSTEMS CATALOG.
Minnesota Water Resources Council, St. Paul. Water and Related Land Resources Information Systems Subcommittee.

LIBRARY U. OF I. URBANA-CHAMPAIGN

Available from the National Technical Information Service, Springfield, Va., 22161, as PB-251 688, $6.00 in paper copy, $2.25 in microfiche. December 1974. 197 p. OWRT-A-031-MINN(1).

Descriptors: *Minnesota, *Information exchange, *Information retrieval, Documentation, Publications, Projects, *Data collections.
Identifiers: *Information systems, Information dissemination.

This catalog is a compilation of inventories of water and related land resources information systems used by State agencies, selected colleges, and the University of Minnesota. This catalog is divided into four sections. The first offers an introduction, study outline and rationale for the catalog. The second describes the many information systems inventoried. Due to the complexity of each system it was impossible to order them according to information system function. This section is therefore classified by organization rather than information type. A third section of this catalog is a cross tabulation of information types and organizations. This shows which organizations manage which information types. Within each matrix of the cross tab an Organizational Data Function Code, Data Time/Space Coverage Code and Information System Capability Code are presented. Thus, organization, information types, methodology of collection, use, and analysis are presented in this cross-tabulation. The final section of the catalog is a detailed index of information types which indicates the pages from the catalog on which this information is discussed.
W76-06256

BIBLIOGRAPHY OF STUDIES ON THE DENSITY AND OTHER VOLUMETRIC PROPERTIES FOR MAJOR COMPONENTS IN GEOTHERMAL WATERS, 1928-1974,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W76-06454

GEOLOGIC AND WATER-SUPPLY REPORTS AND MAPS--WYOMING, JULY 1975,
Geological Survey, Reston, Va.
Geological Survey Publications List, 1975. 55 p.

Descriptors: *Bibliographies, *Publications, *Water resources, *Geology, *Wyoming, Mineralogy, Maps, Information retrieval, Methodology, Costs.
Identifiers: *US Geological Survey reports(Wyo).

This list contains reports and maps published by the U.S. Geological Survey relating to the geology and mineral and water resources of Wyoming. Bulletins, professional papers, water-supply papers, and other book reports for which a price is stated are for sale by the Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, Va., 22202, and from the U.S. Geological Survey, Public Inquiries Offices: 1961 Stout Street, Room 1012, Federal Building, Denver, Col., 80202; and 125 South State Street, Room 8102, Federal Building, Salt Lake City, Utah 84138. Numerous libraries and educational institutions throughout the country are depositories for this material, and a list of depositories is included. (Woodard-USGS)
W76-06456

SOLAR ENERGY TECHNOLOGY, STATE OF THE ART, AN ANNOTATED BIBLIOGRAPHY,
Ocean Engineering Information Service, La Jolla, Calif., Energy Resources Div.
For primary bibliographic entry see Field 03A.
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INVENTORY OF FLORIDA COASTAL ZONE PLANNING PUBLICATIONS: VOLUME I, COASTAL COUNTIES AND CITIES.
Florida Dept. of Nautral Resources, Tallahassee. Bureau of Coastal Zone Planning.
For primary bibliographic entry see Field 02L.
W76-06566

INVENTORY OF FLORIDA COASTAL ZONE PLANNING PUBLICATIONS: VOLUME II, MULTI-COUNTY PLANNING DISTRICTS.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Coastal Zone Planning.
For primary bibliographic entry see Field 02L.
W76-06567

INVENTORY OF FLORIDA COASTAL ZONE PLANNING PUBLICATIONS: VOLUME III, STATEWIDE.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Coastal Zone Planning.
For primary bibliographic entry see Field 02L.
W76-06568

STATE-OF-THE-ART SURVEY AND EVALUATION OF MARSH PLANT ESTABLISHMENT TECHNIQUES: INDUCED AND NATURAL; VOLUME I: REPORT OF RESEARCH,
Michigan Univ. Ann Arbor, School of Natural Resources.
For primary bibliographic entry see Field 04A.
W76-06635

STATE-OF-THE-ART SURVEY AND EVALUATION OF MARSH PLANT ESTABLISHMENT TECHNIQUES: INDUCED AND NATURAL; VOLUME II: A SELECTED ANNOTATED BIBLIOGRAPHY ON AQUATIC AND MARSH PLANTS AND THEIR MANAGEMENT,
Michigan Univ., Ann Arbor, School of Natural Resources.
For primary bibliographic entry see Field 04A.
W76-06636

10F. Preparation Of Reviews

STATE-OF-THE-ART SURVEY AND EVALUATION OF MARSH PLANT ESTABLISHMENT TECHNIQUES: INDUCED AND NATURAL; VOLUME I: REPORT OF RESEARCH,
Michigan Univ. Ann Arbor, School of Natural Resources.
For primary bibliographic entry see Field 04A.
W76-06635

STATE-OF-THE-ART SURVEY AND EVALUATION OF MARSH PLANT ESTABLISHMENT TECHNIQUES: INDUCED AND NATURAL; VOLUME II: A SELECTED ANNOTATED BIBLIOGRAPHY ON AQUATIC AND MARSH PLANTS AND THEIR MANAGEMENT,
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- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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VOLUME 9, NUMBER 14
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he Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the ansaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

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USE OF PERTURBED GAMMA-GAMMA DIRECTIONAL CORRELATIONS IN THE STUDY OF ANOMALOUS WATER STRUCTURE,
North Dakota State Univ., Fargo. Dept. of Physics.
For primary bibliographic entry see Field 1B.
W76-06906

1B. Aqueous Solutions and Suspensions

USE OF PERTURBED GAMMA-GAMMA DIRECTIONAL CORRELATIONS IN THE STUDY OF ANOMALOUS WATER STRUCTURE,
North Dakota State Univ., Fargo. Dept. of Physics.
J. C. Glass, and G. Graf.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-252 190, $3.50 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report No. WI-222-008-75, July, 1975, 11 p, 13 ref. OWRT-B-010-NDAK(1). 14-31-001-3318.

Descriptors: *Spectroscopy, *Water Structure, Water properties, Molecular structure, Hydrogen bonding, Colloids, Protein, Analytical techniques.
Identifiers: *Nuclear Spectroscopy, *Anomalous water, Perturbed directional correlations.

Perturbed gamma-gamma directional correlation is a branch of nuclear spectroscopy. When two gamma rays from a radioactive nucleus are emitted in a cascade their directional correlation can be perturbed by the interaction of the nucleus with extranuclear fields. Very small tracer concentrations (10-12M) are usually quite sufficient to probe the internal structure of the medium. By using Ba-133 ions the structure of water associated with the globular protein carbonic anhydrase was investigated. Water at the protein interface is highly ordered resembling ice in its properties. A study by this technique of water droplets condensed in capillaries showed that the abnormally high viscosity of the sample is not the result of covalent bonding but rather originates from exceptionally strong hydrogen bonding. The internal fields and symmetry characteristics of the active region andactive site carbonic anhydrase were also investigated by using Co-57 tracer.
W76-06906

2. WATER CYCLE

2A. General

COMPARISON OF THE GEORGIA TECH, KANSAS, KENTUCKY, STANFORD AND TVA WATERSHED MODELS IN GEORGIA,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
A. M. Lumb.
Georgia Environmental Resources Center, Atlanta, Report ERC-0476, January 1976, 137 p, 11 fig, 17 tab, 52 ref, 2 append. OWRT A-047-GA(2) 14-31-0001-4010.

Descriptors: Hydrology, *Simulation analysis, Rainfall-runoff relationships, *Georgia, *Streamflow, Soil moisture, Infiltration, Evapotranspiration, Interflow, Surface runoff, Baseflow, Subsurface flow, Hydrologic data, *Computer models, Flood forecasting, Low-flow simulation, Water yield, Water supply, *Model studies, Watersheds(Basins), *Optimization.
Identifiers: *Watershed models, Parameter optimization.

Watershed models programmed for continuous simulation were compared. The Georgia Tech, Kansas, Kentucky, Standford and TVA Watershed Models were calibrated on a mountain, a piedmont and a coastal plain watershed in Georgia. Eight years were simulated and only the first four years were used for calibration. Plots of daily streamflow hydrographs and correlation coefficients were used for comparison. Methods to compute surface runoff in each model were adequate. Accuracies of the data bases were not sufficient for a more refined comparison. Slightly lower correlation coefficients suggest the Kansas and TVA models may not simulate surface runoff quite as well though the daily time step of the TVA model may be more a factor than the method of computing the surface runoff. Interflow concepts of the Standord Watershed Model which relate to the first soil zone were judged better than the Kansas and Georgia Tech models which relate inter-flow to the second soil zone. Baseflow was simulated poorly with the TVA model because the objective function for parameter optimization was not appropriate. Baseflow was simulated poorly with the Kentucky model because the optimization method was inadequate. Baseflow on all models could be improved slightly by using the groundwater evapotranspiration parameter. Two seasonal parameters in the Kentucky Watershed Model were not found necessary and caused a misrepresentation of the lower zone for Camp Creek. Problems were encountered when providing actual evapotranspiration instead of potential evapotranspiration as input to the TVA model. Little or no deterioration in accuracy of streamflow predictions resulted from extrapolating to periods longer than the calibration period.
W76-06806

BOOKS ON WATER AND WASTEWATER.
National Center for Scientific and Technical Documentation, Brussels (Belgium).
For primary bibliographic entry see Field 10C.
W76-06816

DECISION ANALYSIS FOR WATERSHED MANAGEMENT ALTERNATIVES,
Arizona Univ., Tucson, School of Renewable Natural Resources.
For primary bibliographic entry see Field 4D.
W76-06905

CONTRIBUTION TO THE PROBLEM OF COMPUTING PRECIPITATION OVER MOUNTAIN DRAINAGE BASINS,
For primary bibliographic entry see Field 2B.
W76-07082

SOME GENERAL PRECIPITATION-RIVER FLOW RELATIONSHIPS IN ENGLAND AND WALES,
Bristol Univ. (England). Dept. of Geography.
M. G. Anderson.
Weather, Vol. 30, No. 11, p 368-371, November 1975. 3 fig, 1 tab, 9 ref.

Descriptors: *Precipitation(Atmospheric), *Runoff, *Rainfall-runoff relationships, Fourier analysis, Watersheds(Basins), Streamflow, Rivers, Spatial distribution, Surface waters, Hydrology.
Identifiers: *England, *Wales.

The purpose of this brief paper is to analyze for a limited number of stations in England and Wales both the timing of maximum precipitation and the timing of maximum riverflow and to attempt an interpretation of the resulting spatial patterns. Harmonic analysis was used with the records from 19 watersheds to derive the spatial pattern of time of maximum annual precipitation and the pattern of maximum river flow. These patterns were combined to obtain the pattern of lag time between the maximum precipitation and maximum discharge. The results of the analyses of phase lag between precipitation and river flow series at the annual frequency by harmonic analysis confirmed the strong spatial pattern in such lags. Such patterns are accounted for by broad geological and evapotranspiration differences. (Sims - ISWS)
W76-07088

2B. Precipitation

THE PRECIPITATION CHEMISTRY OF WESTERN NEW YORK STATE: A METEOROLOGICAL INTERPRETATION,
Cornell Univ., Ithaca, N. Y.
For primary bibliographic entry see Field 2K.
W76-06815

AN ANALYSIS OF FOUR SHOWERS WITH RAINFALL RATES > 250 MM/HR,
Hawaii Univ., Honolulu. Dept. of Meteorology.
C. M. Fullerton, and S. K. Wilson.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-252 191, $4.50 in paper copy, $2.25 in microfiche. Hawaii Water Resources Research Center, Honolulu, Technical Report No. 90, UHMET 75-03, June 1975. 45 p, 22 fig, 5 tab, 14 ref, append. B-032-HI OWRT(1). 14-31-0001-5011

Descriptors: *Cloud physics, *Rainfall intensity, Atmospheric pressure, Dew point, Meteorological data, Wind velocity, Networks, *Precipitation(Atmospheric), Monitoring.
Identifiers: *Raymond-Wilson rainfall intensity gauge, Showers, Cloud rain showers.

A computer monitored network of rapid-response Raymond-Wilson rainfall intensity gauges is operating at the Cloud Physics Observatory (CPO), on the windward coast of the island of Hawaii, recording the passage of both warm and cold cloud rain showers. During a one-year (1 July 1973 to 30 June 1974) monitoring period, 57 rainfall events were recorded with intensities plus or minus 95 mm/hr. Four of these events exhibited rainfall rates plus or minus 250 mm/hr. Each of these events is analyzed as a case study documenting the network rainfall intensity records, the associated local variations in potential gradient, surface wind velocity and atmospheric pressure, rawinsonde soundings of temperature, dew point and winds, satellite and 250-mb wind data, and an isohyetal presentation of the accumulated rainfall over the island. Of the four cases studied, three were clearly of cold cloud origin, two being synoptic-scale events associated with low pressure centers west of Hawaii and the third a highly localized thunderstorm related to an upper level trough. The most interesting case was a 268 mm/hr rainfall intensity event almost certainly of warm cloud origin. This case (22 June 1974) may represent a record high rainfall rate from clouds known to lie entirely beneath the freezing level. Finally, a comparison is made of the winds aloft with a calculated disturbance velocity indicating, in most cases, that the surface wind gust occurring just before the onset of rainfall is approximately equal to the wind vector at cloud level. Two anomalous cases are discussed briefly.
W76-06907

POTENTIAL USE OF RADAR DIFFERENTIAL REFLECTIVITY MEASUREMENTS AT ORTHOGONAL POLARIZATIONS FOR MEASURING PRECIPITATION,
Ohio State Univ., Columbus. Atmospheric Sciences Program; and Ohio State Univ., Columbus. Dept. of Electrical Engineering.

LIBRARY U. S. GEOLOGICAL SURVEY

Field 2—WATER CYCLE

Group 2B—Precipitation

T. A. Seliga, and V. N. Bringi.
Journal of Applied Meteorology, Vol. 15, No. 1, p 69-76, January 1976. 7 fig, 27 ref.

Descriptors: *Remote sensing, *Radar, *Precipitation(Atmospheric), Rainfall, Drops(Fluids), Raindrops, Precipitation intensity, Rainfall intensity, Measurement, Analytical techniques, Cloud physics, Meteorology.
Identifiers: *Drop-size distributions.

The potential use of differential reflectivity measurements at orthogonal polarizations to determine rainfall rate was examined. The method involves measurements of Z sub H and Z sub V, the radar reflectivity factors due to horizontally and vertically polarized incident waves respectively. The differential reflectivity, Z sub DR=10 log (Zsub H/Z sub V), which should be precisely determinate, occurs as a result of the distortion of raindrops as they fall at terminal velocity. The approximate theory of Gans for electromagnetic scattering by spheroids was applied to the distorted raindrops. Assuming a general exponential form for the raindrop size distribution, equations were derived relating the distribution parameters to the measurements. The determination of rainfall rate followed directly. Finally, the sensitivity of the distribution parameters to radar inaccuracies was examined, and several methods of implementing the measurements were suggested. It was concluded that good estimates of rainfall rate using a single non-attenuating wavelength radar are possible under ideal conditions. (Sims - ISWS)
W76-06927

PRECIPITATION RATES FOR SOME TYPES OF SOLID HYDROMETEORS,
Wyoming Univ., Laramie.
A. H. Auer, Jr.
Weather, Vol. 30, No. 10, p 336-338, October 1975. 1 tab.

Descriptors: *Hail, *Snow, *Precipitation intensity, Rates, Measurement, Precipitation(Atmospheric), Ice, Melt water, Meteorology.

Normally, the total water-equivalent amount or water-equivalent precipitation rate is used to characterize all documented precipitation. For all types of rainfall, and even some snowfall, this information translates easily to the interested party. But water-equivalent precipitation rates of other solid hydrometeors, like soft hail, hail, or snowflakes, are not well known. Often the contribution by hailfall alone to the total water amount is masked during a precipitation episode of rain plus hail. This brief note described a few measurements of water-equivalent precipitation rates for some solid hydrometeor types (soft hail, hail and snowflakes). Precipitation rates for the solid hydrometeors were measured by exposing an open, high-walled pan to the precipitation for a measured time interval. After the precipitation episode had ended, the contents of the pan were emptied into a plastic bag; the net mass of solid hydrometeors was then determined by weighing the bag and then emptying, drying and reweighing the bag on a laboratory balance to an accuracy of + or -0.01 g. Exposure times varied from 15-30 min, depending on the visual constancy of the precipitation or its duration. Precipitation rates measured in this manner are really mass fluxes: mass per unit area per unit time. Since the net mass of the accumulated solid hydrometeors remains constant even if it is melted, a simple conversion to the equivalent depth of melted water can be made. Two examples of hailfall consisting of stones of slightly larger than 1 cm diameter (with no accompanying rain) give nearly identical precipitation rates of just over 15 mm/hr. (Sims - ISWS)
W76-06934

SOME REMARKS ON MODELING OF THE EARLY STAGES OF CLOUD FORMATION IN A SIMULATION CHAMBER,
Missouri Univ., Rolla, Graduate Center for Cloud Physics Research.
A. N. Saad, J. Podzimek, and J. C. Carstens.
Journal of Applied Meteorology, Vol. 15, No. 2, p 145-156, February 1976. 16 fig, 3 tab, 29 ref, 1 append. NSF GA-36041, ONR N00014-69-A-0141-0005.

Descriptors: *Cloud physics, *Model studies, *Nucleation, Clouds, Raindrops, Drops(Fluids), Particle size, Cloud seeding, Mathematical models, Meteorology.
Identifiers: *Cloud chambers, Cloud simulation.

A numerical model has been developed to describe the early stage of cloud formation in a relatively small simulation chamber. The result for adiabatic expansion showed a tendency for the cloud droplet spectrum to narrow, similar to the results obtained by other authors. The influence of updraft fluctuations was not as important as the fluctuation of temperature which depends upon the amplitude and frequency of the fluctuations, and the expansion rate of volume. Simple models of the sedimentation of the drops showed that sedimentation might be a factor limiting the rate of expansion. Nuclei suddenly introduced into the cloud parcel indicated that the seeding effect depends significantly on the concentration and size of predominantly larger nuclei. (Sims - ISWS)
W76-07070

METEOROLOGICAL INTERPRETATIONS OF THE IMAGES FROM THE NIMBUS 5 ELECTRICALLY SCANNED MICROWAVE RADIOMETER,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
T. T. Wilheit, J. S. Theon, W. E. Shenk, L. J. Allison, and E. B. Rodgers.
Journal of Applied Meteorology, Vol. 15, No. 2, p 166-172, February 1976. 14 fig, 9 ref.

Descriptors: *Remote sensing, *Rainfall disposition, *Clouds, *Oceans, Rainfall, Weather, Weather data, Weather patterns, Instrumentation, Satellites(Artificial), Microwaves, Radiation, Meteorology.
Identifiers: *Electrically Scanning Microwave Radiometer, Nimbus, Radiometers.

The Electrically Scanned Microwave Radiometer (ESMR) on the Nimbus 5 satellite measures the microwave radiation emitted by the earth and the atmosphere in a wavelength band centered at 1.55 cm. At these wavelengths, the emissivity of the earth and atmosphere varies considerably more than at infrared wavelengths. Thus the contrast in radiance between land surfaces, which have high emissivities, and ocean surfaces, which have low emissivities, makes continents and islands readily distinguishable. There is a minimum of interference from clouds since most non-raining clouds are virtually transparent at these wavelengths. However, atmospheric moisture does modify the radiation emitted by the surface and when cloud droplets reach precipitable size, they enhance the radiation considerably over surfaces of low emissivity (e.g., over oceans), making it possible to map areas of rainfall as well as regions of heavy cloudiness. In this application the ESMR images are meteorologically useful in determining the extent, structure and, qualitatively, the intensity of rainfall. It is then possible, over oceans, to determine the location of frontal rain, rain/snow boundaries, and the structure of tropical storms. Because of the generally high emissivities of land surfaces and the wide range of values they assume, interpretation of atmospheric parameters over land is not possible at present. (Sims - ISWS)
W76-07071

AN OBJECTIVE RAINFALL INTERPOLATION AND MAPPING TECHNIQUE,
British Meteorological Office, Bracknell (England).
R. J. Shearman, and P. M. Salter.
Hydrological Sciences Bulletin, Vol. 20, No. 3, p 353-363, September 1975. 4 fig, 3 tab, 9 ref.

Descriptors: *Rainfall disposition, Rainfall, *Areal, *Isohyets, *Distribution patterns, Mathematical studies, Rain gages, Depth-area curves, Contours, Mapping, Weather data, Hydrologic data, Average, Meteorology.
Identifiers: *United Kingdom, *Rainfall interpolation, Lowland catchments, Highland catchments.

A scheme was described for the interpolation of rainfall data from the United Kingdom rainfall station network to a regular 5 km grid. The effects of topography were indirectly allowed for by using a background field of average annual rainfall. A cubic spline technique was used in the computer program to produce isohyetal and isopercentile maps. Areal rainfall was calculated by using the arithmetic mean of rainfall values at the intersections of the 5-km grid. Examples of computer produced maps and computed areal rainfalls were discussed. The objective rainfall interpolation and mapping techniques were demonstrated to be useful for relatively quick analysis of rainfall data in both operational and research functions. Areal rainfall routines produce acceptable results for areas larger than 200 sq km. Grids smaller than the 5-km grid are being developed to better represent the smaller scale features of the rainfall field. (Bender - ISWS)
W76-07074

EVAPORATION DEFICIT UNDER VARIOUS CLIMATIC CONDITIONS ON LAND,
For primary bibliographic entry see Field 2D.
W76-07075

CONTRIBUTION TO THE PROBLEM OF COMPUTING PRECIPITATION OVER MOUNTAIN DRAINAGE BASINS,
A. A. Grigor'yev.
Soviet Hydrology, Selected Papers, No. 5, p 329-333, 1974. 2 fig, 1 tab, 6 ref. Translated from Transactions of the Kazakh Hydrometeorological Scientific Research Institute (Trudy KazNIGMI), No. 5, p 100-106, 1974.

Descriptors: *Precipitation(Atmospheric), *Mountains, *Watersheds(Basins), Runoff, Rivers, Elevation, Orography, Rainfall, Data processing, Hydrology, Meteorology.
Identifiers: *USSR.

The conditions for computing precipitation in mountain drainage basins were analyzed using the basins of the Chu and Talass rivers and of lake Issyk-Kul, which lie in northern Kirghizia and partly in Southern Kazakhstan, as an example. It was found that if only observation points on the valley floor are used to compute precipitation in transverse valleys, the amount of precipitation will be too low in individual vertical zones and in the basin as a whole. Computations from a smoothed curve give results that are more comparable with the total amounts of precipitation obtained by the weighting method than computations from actual curves based on readings at observation points on the floor of the valleys. A significant advantage of computing precipitation from a smoothed curve over computing it from the actual curve is the more justified extrapolation of the curve in its upper part, corresponding to the high-mountain zone for which there are virtually no precipitation observations. This zone, which is most active in runoff formation, accounts for no less than 2/5 of the entire mountain area of the region under study. (Sims - ISWS)
W76-07082

FLOODS IN NEW YORK, 1972, WITH SPECIAL REFERENCE TO TROPICAL STORM AGNES,
Geological Survey, Albany, N. Y.
For primary bibliographic entry see Field 2E.
W76-07123

2C. Snow, Ice, and Frost

ON THE WATER CHANNELS OF THE INTERNAL DRAINAGE SYSTEM OF THE HINTEREISFERNER, OTZTAL ALPS, AUSTRIA,
Geselischaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie.
H. Behrens, H. Bergmann, H. Moser, W. Ambach, and O. Jochum.
Journal of Glaciology, Vol. 14, No. 72, p 375-382, 1975. 5 fig, 1 tab, 14 ref.

Descriptors: *Glaciers, *Melt water, *Drainage, Alpine, Ablation, Ice, Dye releases, Tracers, Rhodamine, Flow, Discharge(Water), Glaciology, Europe.
Identifiers: *Hintereisferner, *Austria.

Studies that had been started in 1971 were continued in the summer of 1972 in order to gather information on the intraglacial run-off system in the ablation region of Hintereisferner. In a long-term test of 30 h, the daily fluctuations of the inflow into a moulin and the discharge at the glacier mouth were measured. A number of injections of dye tracers were made to measure the curve of concentration versus time. Finally, a test was made to compare with last year's results, in which the inflow was marked with dye at three different points on the glacier. From the long-term measurements the daily fluctuations of the average velocity of flow in the intraglacial run-off system and the dispersion coefficient were determined. The results confirmed the previous experiments, showing that the melt water reaches the glacier bed taking the shortest possible route without passing through cavities within the glacier, flowing mostly in an open channel. (Sims - ISWS)
W76-07064

BOUDINAGE IN GLACIER ICE-SOME EXAMPLES,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Geographisches Institut; and Eidgenoessische Technische Hochschule, Zurich (Switzerland). Geologisches Institut.
M. J. Hambrey, and A. G. Milnes.
Journal of Glaciology, Vol. 14, No. 72, p 383-393, 1975. 9 fig, 20 ref.

Descriptors: *Glaciers, *Geomorphology, *Ice, Flow, Strain, Glaciology, Europe.
Identifiers: *Boudinage, *Switzerland, Glacier flow, Foliation.

Boudinage structures have only rarely been reported in glacier ice, yet they seem to be widespread in Swiss glaciers. They form in debris-free, strongly foliated ice by the stretching, necking and rupture of layers or groups of layers, when the principal compressive strain axis lies at a high angle to the layering. Two main types of boudinage were distinguished. The first results from the differences in competence between fine-grained and coarse-grained ice, and indicates that the former is more resistant to flow than the latter. The second occurs in more equigranular ice which shows a strong planar anisotropy; associated with the necking of such ice is the development of shear planes, along which the layers are displaced. As in deformed rocks, it is not possible to determine the directions of the finite principal strain axes from the boudinage structures alone. Although the boudins described here all occur in longitudinal foliation, it was suggested that they are likely to form in other situations also. (Sims - ISWS)
W76-07065

THE DEBRIS CONTENT OF SURGING GLACIERS IN SVALBARD AND ICELAND,
Aberdeen Univ., (Scotland). Dept. of Geography.
C. M. Clapperton.
Journal of Glaciology, Vol. 14, No. 72, p 395-406, 1975. 5 fig, 1 tab, 30 ref.

Descriptors: *Glaciers, *Glacial sediments, *Glacial drift, Gravels, Sands, Till, Sediments, Ice, Surges, Fjords, Geomorphology, Glaciology.
Identifiers: *Surging glaciers, *Svalbard, *Iceland, Debris content.

In Svalbard and Iceland there appears to be much more debris entrained in glaciers that surge than in those which do not. Conditions particularly favorable for the basal incorporation of debris develop as a consequence of the high flow velocities attained by a surge. These are increased cavitation in the lee of obstacles and an increased supply of basal melt water resulting from frictional heat and from the trigger zone. Layers of regelation ice incorporating debris can thus develop to a much greater vertical and horizontal extent than in non-surging glaciers. Excessive shearing and the distortion of foliation structures in the terminal zone of compressive flow enhance the vertical development of the debris-rich regelation layers. Glaciers that surge over outwash and/or fjord-bottom sediments become particularly rich in debris. (Sims - ISWS)
W76-07066

LABORATORY INSTRUMENTS AND APPARATUS FOR INVESTIGATING THE THERMOPHYSICAL INTERACTION OF WATER WITH A FROZEN PEAT DEPOSIT,
For primary bibliographic entry see Field 2G.
W76-07080

INVESTIGATIONS OF THE THAWING OF THE ACTIVE SOIL LAYER IN THE PERMAFROST ZONE,
For primary bibliographic entry see Field 2G.
W76-07081

A COMPARISON OF GLACIER MASS BALANCE BY GLACIOLOGICAL, HYDROLOGICAL AND MAPPING METHODS, SOUTH CASCADE GLACIER, WASHINGTON,
Geological Survey, Tacoma, Wash.
W. V. Tangborn, R. M. Krimmel, and M. F. Meier.
In: Snow and Ice; Proceedings of the Moscow Symposium, August 1971: International Association of Hydrological Sciences Publication No 104, p 185-196, 1975.

Descriptors: *Glaciers, *Mass transfer, *Washington, Analytical techniques, Mapping, Geology, Hydrology, Melt water, Water storage, Water loss, Glaciology.
Identifiers: *Glacier mass balance, *South Cascade(Wash).

Three different methods of determining glacier mass balance were compared on South Cascade Glacier, Washington, during the period 20 June to 10 September 1970. The mass loss measured on the glacier by the glaciological and mapping methods agrees within 2%. The mass loss for the drainage basin calculated by the hydrological method is 38% greater than the loss for the same area measured by the glaciological method. This discrepancy is probably due to the release of liquid water storage from the glacier in summer. These liquid storage changes may account for errors in attempts to measure the annual balance of glaciers by hydrological means. (Woodard-USGS)
W76-07125

GLACIOLOGY,
Geological Survey, Tacoma, Wash.
M. F. Meier.
Reprint from McGraw Hill Yearbook of Science and Technology, 1974, p 224-226, 1975. 2 fig, 2 ref.

Descriptors: *Glaciology, *Remote sensing, *Satellites(Artificial), *Glaciers, *Aerial photography, Data collections, Melt water, Movement, Glacial sediments, Scour.
Identifiers: *Surging glaciers, *ERTS images.

The launch of the first Earth resources technology satellite (ERTS-1) late in 1972 was soon followed by the use of images from the satellite to monitor glacier behavior in a way never before thought possible. Certain classes of glaciers may move so swiftly that valleys may be dammed and the resulting lakes released as devastating floods before the change in the glacier is noticed by mankind. These surging glaciers must be monitored at frequent time intervals. Surge-type glaciers can be distinguished from normal glaciers in high-resolution satellite images. ERTS images have proved to be invaluable in monitoring tidal glaciers in Alaska, such as the Hubbard Glacier, which is advancing and threatening to close off Russell Fjord near Yakutat, and the Columbia Glacier, which may retreat and cast increasing numbers of icebergs into Prince William Sound. In other ERTS images, sediment plumes from Alaskan coastal glaciers, extending more than 50 km into the Pacific Ocean, could be clearly identified. Although it was known that large amounts of sediments are carried to the sea from glaciers, the overall view provided by the satellite images is the first to show visually the extent. (Woodard-USGS)
W76-07130

2D. Evaporation and Transpiration

DISPOSITION OF WATER FROM FRUIT CROPS AND APPROACHES TO INCREASE WATER USE EFFICIENCY,
Florida Univ., Gainesville. Dept. of Fruit Crops.
J. F. Bartholic, D. W. Buchanan, T. Phung, and P. L. Ryan.
Florida Water Resources Research Center, Gainesville, Publication No. 33, February 1976. 99 p, 23 fig, 22 tab, 78 ref. OWRT B-014-FLA (6) 14-31-0001-3868.

Descriptors: *Water utilization, Evaporation pans, *Fruit crops, Evapotranspiration, Recharge, Irrigation, Evaporation, Mist irrigation, *Water loss, *Water balance, Citrus, *Water requirements, Soils, Crop production.
Identifiers: Drip irrigation.

Objectives were to evaluate water loss and needs for fruit crops and to find ways of improving water use efficiency. A year-long water balance study in a 9 acre peach orchard measured inflow of 142 cm, outflow of 55 cm and evapotranspiration (ET) of 91 cm. ET was 0.7 of pan evaporation during the summer and 0.3 in the fall with dormant vegetation. A water balance study for citrus showed a net contribution to the aquifer with present irrigation practices, but no contribution with 100% irrigation. Irrigation needs estimated from daily climatic records varied from 13 to 18 irrigations for a soil with 5 cm of available soil water storage capacity and from 3 to 6 with 10 cm of storage. Plant water stress (PWS) of the same scion (top of tree) on different rootstocks showed wide capabilities of rootstocks to take up soil water. Water sprayed intermittently on leaves reduced PWS and increased tree growth and yield. For 3 years trees with drip or overhead irrigation had no difference in growth, however drip irrigation used 2/3 less water and increased both yields and fruit size. (Morgan-Florida)
W76-06807

CALCULATION OF EVAPORATION RATES DURING THE TRANSITION FROM ENERGY-LIMITING TO SOIL-LIMITING PHASES USING ALBEDO DATA,
Agricultural Research Service; Phoenix, Ariz. Water Conservation Lab.
R. D. Jackson, S. B. Idso, and R. J. Reginato.

Water Resources Research, Vol. 12, No. 1, p 23-26, February 1976. 5 fig, 20 ref.

Descriptors: *Evaporation, *Energy transfer, *Soils, Albedo, Soil surfaces, Potential flow, Lysimeters.
Identifiers: Evaporation rates, Energy-limiting phase, Soil-limiting phase, Potential evaporation, Surface water content, Formulas, Priestly-Taylor formula.

A method was presented that utilizes albedo measurements to partition the fraction of the soil surface area exhibiting energy-limiting (potential) evaporation and the fraction exhibiting soil-limiting evaporation to calculate actual evaporation rates during the transition phase (energy limiting to soil limiting). Since albedo is proportional to the surface water content, the change in albedo from day to day was indicative of the fraction of the soil surface that was dry and evaporating at the soil-limiting rate. By denoting the partitioning factor as beta and by using a square root of time relation with a coefficient C for the soil-limiting phase the evaporation rate Ec for a day n after the soil was wet was expressed by a formula where Ep was the energy-limiting rate. The Priestly-Taylor formula was used to calculate Ep. Calculated evaporation rates were compared with lysimetrically determined rates. It was concluded that this method is reliable for calculating evaporation rates during the transition phase of soil drying. (Roberts - ISWS)
W76-06935

EVAPORATION DEFICIT UNDER VARIOUS CLIMATIC CONDITIONS ON LAND,
L. I. Zubenok.
Soviet Hydrology, Selected Papers, No. 4, p 251-257, 1974. 1 fig, 1 tab, 14 ref. Translated from Transactions of the Main Geophysical Observatory (Trudy GGO), Vol. 307, p 155-164, 1974.

Descriptors: *Evaporation, *Evapotranspiration, *Climatic zones, *Irrigation, Climatic data, Climates, Temperature, Solar radiation, Irrigation practices, Hydrologic budget, Climatology.
Identifiers: *Evaporation deficit, *Potential evapotranspiration.

The difference between evaporative power and total evaporation, i.e., the evaporation deficit, can be regarded as a water deficit and used as a criterion for the irrigation rate. The evaporation deficit can serve as an index of water availability for estimating not only mean annual but also short-period wetting conditions, making it possible to judge the water regime of plants in the course of the year. Information on the intra-annual variations in the evaporation deficit for the Soviet Union has been presented elsewhere. Here the annual pattern of the evaporation deficit under various climatic conditions on land was discussed. The monthly evaporative power and evaporation values needed to compute the evaporation deficit were determined by the methods proposed by M. I. Budyko. (Sims-ISWS)
W76-07075

SOIL MOISTURE FLUX AND EVAPOTRANSPIRATION DETERMINED FROM SOIL HYDRAULIC PROPERTIES IN A CHAPARRAL STAND,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W76-07083

LEAF WATER POTENTIAL RESPONSE TO TRANSPIRATION BY CITRUS,
Instituto Colombiano Agropecuario, Bogota.
S. E. Camacho-B, M. R. Kaufmann, and A. E. Hall.
Physiol Plant. 31(2), p 101-105, 1974.

Descriptors: *Citrus fruits, *Oranges, Model studies, *Water requirements, *Transpiration, *Leaves.
Identifiers: Citrus-Limonia, Citrus-Reshni, Citrus-Sinensis, Citrus-Spp, Poncirus-Trifoliata, Seedlings, Leaf water potential.

Further studies of a model for interpreting leaf water potential data for C. (sinensis) are reported. Experimental data confirmed the assumption that the ratio of vapor pressure deficit to leaf diffusion resistance adequately estimates transpiration when leaf-to-air temperature differences are small. Date collected diurnally indicated that the relationship between leaf water potential and transpiration followed a sequence of steady states without hysteresis. No difference in water transport characteristics was found for Valencia orange on 3 rootstocks in well-watered soil, but the 2 rootstocks Cleopatra mandarin (C. reshni) and Rangpur (C. limonia) gave slightly greater leaf water stress in Valencia orange leaves than Troyer citrange (C. sinensis X Poncirus trifoliata) rootstock at high transpiration rates under mild soil water deficits. In laboratory studies, previously unstressed seedlings had higher leaf water potentials than field trees at equivalent transpiration rates. After several drying cycles, leaf water potentials were similar to those observed in the field.--Copyright 1974, Biological Abstracts, Inc.
W76-07256

THE INFLUENCE OF MOISTURE STRESS ON LIRIODENDRON TULIPIFERA L. SEEDLINGS,
Virginia Polytechnic Inst. of State Univ., Blacksburg. Dept. of Forestry and Forest Product.
For primary bibliographic entry see Field 2I.
W76-07259

EFFECTS OF SILICONE ANTITRANSPIRANT ON WOODY PLANTS,
Wisconsin Univ., Madison. Dept. of Forestry.
K. J. Lee, and T. T. Kozlowski.
Plant Soil. 40(3): 493-510. Illus. 1974.

Descriptors: Trees, *Pine trees, *Transpiration, *Emulsions, *Chlorophyll, Water balance, *Antitranspirants, Toxicity, *Weather.
Identifiers: Acer-Saccharum, Fraxinus-Americana, Pinus-Resinosa, Pinus-Strobus, *Seedlings, *Silicone, *Woody plants.

Effects of Dow Corning silicone emulsion antitranspirant (XF-4-3561 Fluid) on transpiration of Fraxinus americana, Acer saccharum and Pinus residosa seedlings and on chlorophyll content and seedling mortality of these species and Pinus strobus were investigated. The effect of silicone on expansion of new (current year) needles of P. resinosa and P. strobus was also studied. Transpiration of Fraxinus seedlings treated with 1, 3, 5, 8, or 10% silicone was reduced for only 1 day. Five and 3% silicone reduced transpiration by about 79% and 49% in Acer. The effects of 5% silicone lasted at least 7 days and of 3% silicone for about 5 days. Five % silicone decreased transpirations of P. resinosa by 90% for more than 10 days in plants growing in wet or dry soil. Internal water balance of P. resinosa needles was improved 12 days after treatment with 5% silicone. Silicone emulsion at 50, 20 and 10% was toxic to all 4 species. Fifty % silicone killed all 4 species. Twenty % silicone killed Acer and P. resinosa seedlings, and caused shedding of whole leaves of Fraxinus. Ten % silicone induced brown spots (about 1 mm in diameter) on Fraxinus leaflets, browning at tips of Acer leaves, and a light green color at tips of new (current-year) needles of P. resinosa and P. Strobus. Elongation of new (current-year) needles of P. resinosa and P. strobus seedlings was significantly retarded by 20 and 10% silicone. The growth rate of new needles of P. strobus during the 2nd mo. after treatment with 10 or 20% silicone was higher than that of plants treated with 3 or 1% silicone or of control plants. Three % silicone also retarded growth of new needles of P. resinosa. Chlorophyll content 45 days after application of 20% or 10% silicone was reduced in all 4 species. Three percent silicone reduced chlorophyll content in P. resinosa and A. saccharum, but not in Fraxinus or P. strobus.--Copyright 1974, Biological Abstracts, Inc.
W76-07260

VARIATION IN DROUGHT TOLERANCE IN EUCALYPTUS VIMINALIS LABILL,
Melbourne Univ., Parkville (Australia). School of Botany.
For primary bibliographic entry see Field 2I.
W76-07398

WATER ECONOMY OF A FICTIVE CROP,
Agricultural Univ., Wageningen (Netherlands). Instituut voor Biologisch en Scheikundig Onderzoek van Landbouwgewassen.
G. F. Makkink, and H. D. J. VanHeemst.
Versl Landbouwkd Onderz (Agric Res Rep), 817, p 1-38, 1974.

Descriptors: Computer programs, Crops, Water utilization, Transpiration, Estimating, Simulation analysis.

A computer program for simulation of the water economy of a fictive crop is described. Although all processes have been extremely simplified, the results agree, quantitatively, with what is known about the transpiration process. Changes in parameters and given curves make it possible for the influence of several external and internal factors to be estimated.--Copyright 1975, Biological Abstracts, Inc.
W76-07402

ESTIMATES OF EVAPOTRANSPIRATION RATES AT GUELPH, CANADA, BY PENMAN AND THORNTHWAITE METHODS,
Cape Coast Univ. (Ghana). Dept. of Physics.
A. N. De-Heer-Amissah.
Ghana J Sci. 13(2), p 124-133, 1973.

Descriptors: *Canada, *Evapotranspiration, Grasses, Methodology, Measurement, Regression analysis.
Identifiers: *Grass cover, Guelph, Penman method, Thornthwaite method.

Potential evapotranspiration rates over a grass cover have been estimated using Penman's and Thornthwaite's methods. The 2 methods give comparable estimates if annual totals are considered. Monthly totals differ from one another. From May to July Penman estimates are higher than Thornthwaite estimate but after July Thornthwaite estimates become higher. This observation is attributed to the fact that temperature which is the predominant term in the Thornthwaite expression lags behind radiation by about 6 wk. There is a high correlation between evapotranspiration energy (PEp) and net radiation (RN),(r=0.96). The ratio PEp/RN is about 0.75 from May to Nov for Guelph. This ratio however shows a seasonal variation being highest in July. It is suggested, on the basis of the high correlation between PEp and RN, that together with actual soil moisture measurements, values of RN may be used to make reasonable estimates of actual evapotranspiration rates. The regression equation for 1 station would not necessarily hold for another station which has a different climatic regime.--Copyright 1975, Biological Abstracts, Inc.
W76-07404

THE EFFECT OF WIND ON GRASSES: I. CUTICULAR AND STOMATAL TRANSPIRATION,
Edinburgh Univ. (Scotland). Dept. of Forestry and Natural Resources.
J. Grace.
J Exp Bot. 25(86), p 542-551, 1974.

Descriptors: *Transpiration, *Effects, *Grasses, *Winds, Measurement.
Identifiers: Dactylis-Glomerata, Festuca-Arundinacea, Festuca-Pratensis, Lolium-Perenne.

Transpiration of Festuca arundinacea Schreb, strain S170, was measured at 2 different wind speeds in a controlled-environment wind tunnel. As a result of a wind increase from 1 m s-1 to 3.5 m s-1 above the sward, transpiration gradually increased, especially at night-time. Similar effects were noted in 3 other grass species (F. pratense, Lolium perenne, Dactylis glomerata). The transpiration increase could be attributed to decreases in stomatal and cuticular resistances, as a result of leaf buffeting.--Copyright 1975, Biological Abstracts, Inc.
W76-07425

2E. Streamflow and Runoff

COMPARISON OF THE GEORGIA TECH, KANSAS, KENTUCKY, STANFORD AND TVA WATERSHED MODELS IN GEORGIA,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-06806

RECOGNITION AND PREDICTION OF RUNOFF-PRODUCING ZONES IN HUMID REGIONS,
Agricultural Research Service, Danville, Vt.
T. Dunne, T. R. Moore, and C. H. Taylor.
Hydrological Sciences Bulletin, Vol. 20, No. 3, p 305-327, September 1975. 16 fig, 56 ref.

Descriptors: *Humid areas, *Storm runoff, *Overland flow, *Subsurface runoff, *Infiltration, Humid climates, Runoff, Surface runoff, Subsurface flow, Zone of saturation, Topography, Vegetation, Soils, Soil profiles, Soil horizons, Return flow.
Identifiers: *Saturation overland flow, Saturated zone variation, Variable source area concept.

Field experiments on representative and experimental basins have demonstrated the validity of the variable-source concept of storm runoff production in humid regions. Storm runoff is produced on small portions of a catchment which vary in extent during and between storms. In order to make the variable-source concept useful for flood prediction, water quality management, and land planning, it is necessary to develop routine methods for recognizing and quantifying the seasonal and in-storm variation of the saturated runoff-producing zones. The paper suggested various hydrological, pedological and vegetative indicators of this variation. They can be used for prediction of the maximum seasonal extent of saturated conditions, and also for day-to-day accounting, probability studies, and for analyzing the probable effect of some environmental change. The techniques were illustrated with examples from representative and experimental basins in the United States and Canada. (Bender - ISWS)
W76-07073

VARIATIONS IN THE LEVEL REGIME OF HIGHMOOR BOGS IN THE EUROPEAN USSR,
For primary bibliographic entry see Field 2H.
W76-07077

DETERMINATION OF THE PERMEABILITY OF THE PEAT DEPOSIT OF A LOWMOOR BOG,
For primary bibliographic entry see Field 2G.
W76-07078

SOME GENERAL PRECIPITATION-RIVER FLOW RELATIONSHIPS IN ENGLAND AND WALES,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W76-07088

FLOOD PLAINS OF THE SOUTH BRANCH SHIAWASSEE RIVER, LIVINGSTON COUNTY, MICHIGAN,
Geological Survey, Lansing, Mich.
L. E. Stoimenoff.
Open-file report 75-78, 1975. 3 fig, 6 plates, 5 ref.

Descriptors: *Flood plains, *Flood profiles, *Mapping, *Flood frequency, *Michigan, Hydrologic data, Streamflow, Flood data, Planning, Land development.
Identifiers: *South Branch Shiawassee River(Mich), Livingston County(Mich).

Results of a flood-plain study are presented for approximately 1.9 mi of the South Branch Shiawassee River in, Livingston County, Mich. This reach of stream is in a currently unicorporated area about 40 mi northwest of Detroit. Although little development has taken place, the potential for development is great due to urban spread from the Detroit Metropolitan area. To implement local flood-plain management plans, areas subject to flooding are defined. The flood plain is generally swamp or has a dense growth of brush. Much of the stream channel has been dredged and its alignment has been straightened to improve its water carrying capacity. The flood plain is broad throughout the study area. For the 100-year flood, the width of the flood plain generally exceeds 1,500 ft in the lower reaches; upstream the width of the flood plain narrows to about 500 ft. Beyond the limits of the mapped flood plain, the land surface remains relatively flat. These are subject to flooding from rarer floods. (Woodard-USGS)
W76-07113

FLOODS IN PALATINE QUADRANGLE, ILLINOIS,
Geological Survey, Champaign, Ill.
For primary bibliographic entry see Field 7C.
W76-07116

FLOODFLOW CHARACTERISTICS AT BRIDGE SITE ON INTERSTATE HIGHWAY 80, THE GREEN RIVER NEAR GREEN RIVER, WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4C.
W76-07120

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 1. SURFACE WATER RECORDS--VOLUME 1.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-07121

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 5. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--VOLUME 1. HUDSON BAY BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-07122

FLOODS IN NEW YORK, 1972, WITH SPECIAL REFERENCE TO TROPICAL STORM AGNES,
Geological Survey, Albany, N. Y.
F. L. Robison.
Available from National Technical Information Service, Springfield, Va., 22161 as PB-251 116 $5.00 in paper copy, $2.25 in microfiche. Water-Resources Investigations 34-75, January 1976. 91 p, 23 fig, 2 tab, 43 ref.

Descriptors: *Floods, *Flood data, *Peak discharge, *Flood damage, *New York, Hydrologic data, Storms, Rainfall-runoff relationships, Streamflow, Stream gages, Historic floods.
Identifiers: *Tropical storm Agnes(NY).

Intense rainfall associated with Tropical Storm Agnes in late June resulted in the worst flood damage in the history of New York State. Flooding that began in Westchester County on June 19, 1972 was followed by widespread flooding in the Southern Tier and Finger Lakes regions on June 23. Maximum known peak discharges were measured at three major rivers in the State. The Allegheny River crested at the highest discharge of record on June 23 (73,000 cfs or 2,070 cu m/sec). The Chemung River at Chemung reached the highest discharge of record on June 24 (189,000 cfs or 5,350 cu m/sec). The Genessee River raised the water at Mount Morris Dam to the highest level of record (755.8 feet or 230.4 metres). Flooding associated with Tropical Storm Agnes caused 24 deaths and evacuation of 100,000 residents. Damage to private property in the State has been estimated at more than $400 million; to public property, $221 million; and to agriculture $84 million. (Woodard-USGS)
W76-07123

REVISED ESTIMATES OF MEAN-ANNUAL RUNOFF AND SUMMARY OF PRECIPITATION AND DISCHARGE DATA FOR POST HEADQUARTERS AREA, WHITE SANDS MISSILE RANGE, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 7C.
W76-07131

2F. Groundwater

SPECIFIC CONDUCTANCE IDENTIFIES PERCHED AND GROUND WATER LAKES,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2H.
W76-07023

GROUNDWATER YEAR BOOK 1968-70.
Department of the Environment, London (England). Water Data Unit.
Her Majesty's Stationary Office, London (England), November 1975. 146 p, 18 fig, 2 tab, 2 maps.

Descriptors: *Groundwater, *Data collections, *Water levels, *Fluctuations, Observation wells, Sampling, Statistics, Rainfall, Evaporation, Soil moisture, Aquifers, Meteorological data, Information retrieval.
Identifiers: *England, *Wales.

The Groundwater Year Book provides data related to the fluctuations of groundwater levels in principal aquifers, together with meteorological information as it relates to changes in groundwater storage. Metric units are used throughout. This third edition contained information for 1664 observation wells in England and Wales, with samples of the water level statistics for the years 1968, 1969 and 1970. These statistics are now held on computer archive and are available from the Water Data Unit. Since the opportunity now exists for the rapid retrieval and analysis of data, a limited presentation of tabular and graphical output from the computer archive and a description of the retrieval service was provided. Details of rainfall, evaporation and soil moisture deficits in thirteen districts and comments on the weather in relation to groundwater levels were included. Groundwater level fluctuations during 1968 to 1970 in representative wells were described in relation to this meteorological data and to long-term groundwater statistics. (Robinson - ISWS)
W76-07063

A SEISMIC GROUND-WATER SURVEY IN NEW HAMPSHIRE,
New Hampshire Univ., Durham. Dept. of Earth Sciences.
F. S. Birch.
Ground Water, Vol. 14, No. 2, p 94-100, March-April 1976. 4 fig, 9 ref.

Descriptors: *Groundwater, *Hydrogeology, *Seismic studies, *New Hampshire, Surveys, Geology, Seismic properties, Groundwater basins, Groundwater potential, Aquifers, Aquifer characteristics, Water table, Magnetic studies, Bedrock, Topography.
Identifiers: *Barbadoes Pond(NH).

The drainage basin of Barbadoes Pond, Madbury and Dover, southeastern New Hampshire, was studied by seismic refraction and magnetic measurements as part of an interdisciplinary investigation. The purpose of the geophysical measurements was to provide boundary conditions (bedrock and water-table elevations) for a mathematical model of groundwater flow. The basin is intensively used for recreation, municipal water supply, and sand and gravel mining. Barbadoes Pond is a kettle lake lying in the middle of a broad, flat-topped sand and gravel hill (a 'kame plain'). The plain is surrounded by marine clay at a lower elevation. A broad, deep, northwest-southwest trending trough underlies the plain according to seismic refraction measurements (45 lines) and water wells. The present form and location of the trough are attributed to glacial enlargement of a stream valley eroded along a bedrock shear zone. The bedrock topography and seismic velocity are directly related to erosion resistance of the vertically dipping metasedimentary bedrock. Magnetic anomalies are consistent with the seismic results. Water-table elevation correlates with bedrock elevation, not surface elevation. This is a consequence of highly permeable sand and gravel, the principal surfical materials. Apparently the pond is not hydraulically independent of nearby wells and a large reservoir. The results invited speculation that kame plains occur over bedrock troughs. Such a relationship would speed search for good well sites in this region of rapid population growth and industrial development. (Sims - ISWS)
W76-07086

APPLICATION OF GEOCHEMICAL PRINCIPLES, ISOTOPIC METHODOLOGY, AND ARTIFICIAL TRACERS TO KARST HYDROLOGY,
Geological Survey, Reston, Va.
W. Back, and J. Zoetl.
Reprint from Hydrogeology of Karstic Terrains, International Union of Geological Sciences, Series B, No 3, Chapter IX, p 105-121, 1975: Paris, International Association of Hydrogeologists. 16 fig, 1 tab, 49 ref.

Descriptors: *Karst hydrology, *Geochemistry, *Groundwater movement, *Tracking techniques, Radioisotopes, Tracers, Tritium, Subsurface drainage, Hydrologic data.

Examples are presented of the application of the geochemical principles, isotope methods and tracing techniques to studies of karst hydrology. The main objectives of geochemical and isotope studies in karst terranes are: (1) to determine geographic and stratiographic distribution of chemical type of water; (2) to identify controlling reactions and their rates; and (3) to understand the physics of the system, i.e., source, types of springs, groundwater flow pattern, areas of recharge and discharge, and rate of movement. The purpose of achieving these objectives is: (1) to determine the availability and quality suitability of the water for utilization of municipal and domestic supplies, industrial requirements, or irrigation; (2) to predict temporal and spatial changes that occur as a result of imposing natural or man-made stresses on the system, such as injection of recharge water or wastes, additional withdrawal, diversion of flow by construction of dams or canals, or various activities that would permit encroachment of salt water. (Woodard-USGS)
W76-07112

AVAILABILITY OF GROUND WATER IN THE UPPER CONNECTICUT RIVER BASIN, NORTHERN NEW HAMPSHIRE,
Geological Survey Concord, N. H.
For primary bibliographic entry see Field 7C.
W76-07114

WATER RESOURCES OF THE CEDAR RIVER WATERSHED, SOUTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-07117

WATER RESOURCES OF THE RIVER RAISIN BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C.
W76-07118

GROUND-WATER LEVELS ON BOSTON PENINSULA, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W76-07119

WATER-LEVEL RECORDS FOR THE SAN LUIS VALLEY OF COLORADO, 1972-76,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-07129

STATE-OF-THE-ART OF GEOTHERMAL RESERVOIR ENGINEERING,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-07209

MICROFLORA OF THE WATERS OF ONE OF THE UNDERGROUND SPRINGS OF THE KARAKALPAK ASSR, (IN RUSSIAN),
Complex Inst. of Natural Sciences, Nukus (USSR). Karakalpak Div.
For primary bibliographic entry see Field 5B.
W76-07280

METHOD FOR DETECTING AND LOCATING WATER-PRODUCING ZONES AND/OR WATER THIEF ZONES IN SUBTERRANEAN FORMATIONS,
Continental Oil Co., Ponca City, Okla. (Assignee).
For primary bibliographic entry see Field 4B.
W76-07448

2G. Water In Soils

POULTRY PROCESSING PLANT WASTEWATER DISPOSAL ON SOD,
Maryland Univ., College Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W76-06811

ON SR90 MIGRATION IN LAND FRESH WATER,
Institute of Experimental Meteorology, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W76-06864

EFFECTS OF SOME NATURAL FACTORS ON THE TRANSITION OF SR90 FROM THE SOIL COVER TO SURFACE WATERS,
Institut Prikladnoi Geofiziki, Leningrad (USSR).
For primary bibliographic entry see Field 5B.
W76-06865

SORPTION OF SR90 BY BOTTOM SEDIMENTS OF A FRESHWATER LAKE,
Akademiya Nauk SSSR, Sverdlovsk, Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 5B.
W76-06872

DETERMINING EMITTANCES FOR USE IN INFRARED THERMOMETRY: A SIMPLE TECHNIQUE FOR EXPANDING THE UTILITY OF EXISTING METHODS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso, R. D. Jackson, and R. I. Reginato.
Journal of Applied Meteorology, Vol. 15, No. 1, p 16-20, January 1976. 4 fig, 14 ref.

Descriptors: *Infrared radiation, *Thermal radiation, *Temperature, Measurement, *Thermometers, Remote sensing, Radiation, Instrumentation, Optical properties, Physical properties, Analytical techniques, *Soil surfaces, Surfaces.
Identifiers: Infrared emittances, *Infrared thermometers.

A simple laboratory technique was described for making rapid emittance measurements with an infrared thermometer. It was shown that when the infrared thermometer head is held flush against a surface, its output is a linear function of surface emittance. Thus, viewing two or more surfaces of known emittance in this manner 'calibrates' the infrared thermometer, so that viewing an unknown surface at the same temperature in this manner will yield its emittance. Emittance values of the standard surfaces employed may be obtained via any of a variety of emittance measurement methods previously developed. A nomograph was presented that shows the possible errors that can occur as a result of temperature differences that may exist between the test and standard surfaces. (Sims - ISWS)
W76-06923

SHALE CHISELING-EFFECT ON WATER YIELD,
Virginia Polytechnic Inst., and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3B.
W76-06924

ON THE DIFFERENTIAL EQUATION FOR THE EQUILIBRIUM MOISTURE PROFILE IN SWELLING SOIL,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
G. Sposito.
Soil Science Society of America Proceedings, Vol 39, No. 6, p 1053-1056, November-December 1975. 20 ref.

Descriptors: *Soil moisture, *Thermodynamics, Equations, *Equilibrium, *Expansive soils, Overburden, Earth pressure, Atmospheric pressure, Profiles, Soil water, Soil properties, Bulk density, Void ratio, *Moisture content, Physicochemical properties.
Identifiers: *Buckingham equation, Soil-water-air systems, *Moisture profiles, Gravichemical potential.

Differential equations which describe the equilibrium vertical distribution of moisture in swelling soil have been derived previously using both thermodynamic and fluid-mechanical methods. A fundamental disagreement exists

between these expressions which was resolved in this paper through a detailed thermodynamic analysis of the equilibrium state of water in a swelling soil. The correct differential equation for the moisture profile was found and the discrepancy between previous results was shown to have been caused either by introduction of extra-thermodynamic variables or by an incorrect handling of the effect of overburden pressure on the soil water. (Visocky - ISWS)
W76-06925

RELATIONSHIP OF GEOMORPHOLOGY TO ORIGIN AND DISTRIBUTION OF A HIGH CHARGE VERMICULITIC SOIL CLAY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
D. A. Lietzke, M. M. Mortland, and E. P. Whiteside.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1169-1177, November-December 1975. 7 fig, 4 tab, 17 ref.

Descriptors: *Terraces(Geologic), *Michigan, *Clay minerals, *Leaching, *Hydrogen ion concentration, *Potassium, Geomorphology, Geochemistry, Geologic control, Acidic soils, Cation exchange, Weathering, Illite, Soil profiles, Sampling, On-site data collections, Soil analysis, X-ray diffraction, Mineralogy, Drainage effects, Alluvium, Age, Aerial photography, Maps, Spatial distribution.
Identifiers: *Vermiculite, Chloritized vermiculite, Dechloritization, Rechloritization, Fixation, Origin, Upland.

Up to 560 kg/ha of elemental K fertilizer was required to obtain optimum yields and quality of tomatoes (Lycopersicon esculentum Mill.) on a low, well-drained terrace of the St. Joseph River in Berrien County, Michigan. The surface layer of the soil contained 15% clay with a Ca/Mg cation exchange capacity of 115 meg/100 g. This clay was capable of fixing about 94% of the applied K fertilizer. A study of the glacial geology and more recent geomorphology in the area showed that the oldest land surface had acid leached soils with the surface layer containing considerable chloritized vermiculitic clays, while, in contrast, the younger terraces had soils higher in pH and surface layers low in chloritized vermiculite. Analysis of the river terrace soils showed that if the pH was greater than 7.5 or less than 6.3 the vermiculite content of the surface layer dropped sharply. The vermiculite in the river terrace soils is apparently derived from chloritized vermiculitic clays from older upland soils. The change of the environment from acid to neutral or mildly alkaline plus abundant organic matter evidently triggers a dechloritization reaction involving aluminate or organic complexing mechanism. (Visocky - ISWS)
W76-06926

CONSIDER THE PLANT IN PLANNING WIND EROSION CONTROL SYSTEMS,
Agricultural Research Service, Big Spring, Tex.
For primary bibliographic entry see Field 4D.
W76-06928

CALCULATION OF EVAPORATION RATES DURING THE TRANSITION FROM ENERGY-LIMITING TO SOIL-LIMITING PHASES USING ALBEDO DATA,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2D.
W76-06935

VARIATIONS IN THE PERMEABILITY OF SOILS IN VARIOUS NATURAL ZONES,
G. V. Nazarov.
Soviet Hydrology, Selected Papers, No. 4, p 263-270, 1974. 2 fig, 2 tab, 16 ref. Translated from News of the All-Union Geographic Society (Izvestiya VGO), No. 4, p 307-314, 1974.

Descriptors: *Permeability, *Soils, *Soil properties, *Variability, Soil water movement, Groundwater, Groundwater movement, Forest soils, Compacted soils, Pervious soils, Chestnut soils, Loam, Soil water, Soil physical properties.
Identifiers: *USSR.

Permeability largely determines the water balance of the soil, including surface runoff, and, therefore, one must know this soil property in hydrology to compute the amount of water absorbed by the soil. All soil properties vary considerably in time and space. Some of the properties vary not only within a distance of a few meters, but even over smaller distances. Experiments were performed on the variation in the permeability of various soils with a relatively small number of replications (from 12 to 18) near Zagorsk at the station of the Institute of Geography of the USSR Academy of Sciences as early as 1959. These experiments were continued in 1962 in the Streletsk steppe (Central Chernozem Reservation) with 51 replications. Starting from 1964, similar studies were made by the Limnological Institute of the USSR Academy of Sciences in several areas of the Northwestern European USSR and in the Northern Caucasus with 8 to 50 replications. In all, 529 experiments on 30 soils were made. Observations showed that the coefficient of variation of the permeability of soils in the forest zone varies from 56.6 to 138% in the first hour and the steady rate is 64.6 to 104%. In the steppe zone the coefficient of variation ranged from 15 to 72% in the first hour and from 15.5 to 95.5% in the second. (Sims-ISWS)
W76-07076

VARIATIONS IN THE LEVEL REGIME OF HIGHMOOR BOGS IN THE EUROPEAN USSR,
For primary bibliographic entry see Field 2H.
W76-07077

DETERMINATION OF THE PERMEABILITY OF THE PEAT DEPOSIT OF A LOWMOOR BOG,
L. G. Bavina.
Soviet Hydrology, Selected Papers, No. 5, p 293-299, 1974. 4 fig, 4 tab, 11 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 222, p 83-92, 1974.

Descriptors: *Bogs, *Permeability, *Percolation, Infiltration, Water levels, Drainage effects, Wetlands, Peat, Marshes, Soil physical properties, Soil-water movement, Groundwater, Hydrologic properties, Hydrology.
Identifiers: *USSR.

The study program called for field determinations of the permeability of peat deposits by the method of level restoration in a well. The advantage of this method for investigating the permeability of peat over the pumping method, which is extensively used in practical hydrogeology, had been mentioned by several investigators. Although it is simple to perform field experiments by this method, it is difficult to justify it theoretically. There are several approximate working formulas. Their computation accuracy depends on the degree of correspondence between the theoretical premises used and actual conditions. It was found that, in determining the permeability of a moderately decomposed lowmoor peat deposit by the method of level restoration, any one of the formulas investigated can be used for computation, provided the heads in the well do not exceed 30-50 cm during a 10-min experiment. In computing the values of the percolation coefficients layer-by-layer in an undrained deposit, when several experiments with increasing well depth must be performed, one should use the formula of the All-Union Scientific Research Institute of Bog Management (VNIIBKh), derived on the assumption that water enters along the entire depth of the well. This assumption is valid for coefficients of 0.01-0.05 cm/sec. The coefficients decrease significantly under the effect of drainage, accompanied by a drop of 50 cm in average annual levels and an average settling of the peat deposit by 25-30 cm. (Sims-ISWS)
W76-07078

LABORATORY INSTRUMENTS AND APPARATUS FOR INVESTIGATING THE THERMOPHYSICAL INTERACTION OF WATER WITH A FROZEN PEAT DEPOSIT,
I. L. Kalyuzhnyy, K. K. Pavlova, and E. Kh. Teregulov.
Soviet Hydrology, Selected Papers, No. 5, p 315-322, 1974. 5 fig, 8 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 222, p 193-204, 1974.

Descriptors: *Instrumentation, *Frozen soils, *Laboratory equipment, Peat, Bogs, Thermal properties, Laboratory tests, Soils, Soil analysis, Infiltration, Melt water, Soil water, Soil water movement, Analytical techniques.

A set of instruments for investigating the amount of unfrozen water in frozen soil, the thermal interaction of meltwaters with frozen soil, and water migration toward the freezing front was described. The instruments and apparatus make it possible to study the thermophysical characteristics of unfrozen and frozen soils, their properties, and thermal interaction processes. (Sims-ISWS)
W76-07080

INVESTIGATIONS OF THE THAWING OF THE ACTIVE SOIL LAYER IN THE PERMAFROST ZONE,
Yu. P. Moskvin.
Soviet Hydrology, Selected Papers, No. 5, p 323-328, 1974. 4 fig, 2 tab, 5 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 222, p 225-233, 1974.

Descriptors: *Frozen soils, *Thawing, *Permafrost, Frozen ground, Soil types, Soils, Bogs, Peat, Mosses, Tundra, Vegetation, Soil moisture, Temperature, Solar radiation.
Identifiers: *USSR, *Siberia, Thawing depths.

To exploit the gas fields in the northern part of West Siberia it became necessary to build roads to deliver equipment to the working, planning, construction, and exploitation sites of various industrial enterprises. This, in turn, required knowledge of the natural conditions in the construction region and, in particular, information on the thermal regime of thawing soils. Investigations were performed in 1971 in one of the regions in the extreme north of the West Siberian plain of the thawing of frozen soils of different landscape features and of the factors determining it. It was found that the active layer in plots without water at the surface, with a peat deposit, and a well developed plant cover thaws to a minimum depth. The depth of thawing on such plots does not exceed 40 cm in the warmest years. Water at the surface of a microlandscape increases the depth of thawing of the active layer by 20-25%, reaching 55-60 cm in the warmest years. In dry areas with clayey and loamy soils, the depth of thawing of the active layer exceeds that in areas with peat soils by a factor of 1.7-1.8. Differences in the nature of the plant cover (type of plants, their height, density, etc.) produce large difference in the depth of thawing of frozen soils in dry areas. The resulting difference in the depth of thawing ranges within 45-85 cm in the warmest years. Distrubance of the plant cover leads to a more than twofold increase in the depth of soil thawing. (Sims - ISWS)
W76-07081

SOIL MOISTURE FLUX AND EVAPOTRANSPIRATION DETERMINED FROM SOIL

HYDRAULIC PROPERTIES IN A CHAPARRAL STAND,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
D. G. School.
Soil Science Society of America Journal, Vol. 40, No. 1, p 14-18, January-February 1976. 3 fig, 1 tab, 11 ref.

Descriptors: *Water balance, *Soil water movement, *Evapotranspiration, *Forest soils, Forests, Evaporation, Hydraulic properties, Soil moisture, Flow, Flow measurement, Precipitation(Atmospheric), Rainfall, Analytical techniques, Darcys law, Hydraulic conductivity, Hydrology, Hydraulics.

Measurements of rainfall, overland flow, soil moisture, and hydraulic properties were obtained from a sloping plot in a chaparral stand. The moisture characteristic and dynamic conductivity were determined from core samples of several soil layers to a depth of 420 cm. A water balance model requiring the above parameters and a Darcian moisture flux analysis was used to predict drainage below the root zone and loss by evapotranspiration. Daily results of the water balance were summarized during 2 water years. Predicted values agreed well with values measured on a nearby watershed during both years--the first an unusually dry year, the second unusually wet. (Sims - ISWS)
W76-07083

BULK DENSITY, SATURATION WATER CONTENT AND RATE OF WETTING OF SOIL AGGREGATES,
MacDonald Coll., Ste. Anne De Bellevue (Quebec). Dept. of Soil Science.
F. A. Gumbs, and B. P. Warkentin.
Soil Science Society of America Journal, Vol. 40, No. 1, p 28-33, January-February 1976. 4 fig, 5 tab, 12 ref.

Descriptors: *Bulk density, *Saturated soils, *Wetting, *Soil aggregates, Soils, Clay loam, Evaporation, Soil moisture, Infiltration, Saturation, Aggregates, Particle size, Capillary action, Soil water, Laboratory tests.

Bulk density, degree of saturation, volume increase on wetting, and rate of wetting were measured for aggregates and clods of Ormstown silty clay loam (Humaquept) of sizes from 5 cm to 0.036 cm diameter. Bulk density increased with a decrease in diameter. For 2.2-mm to 0.36-mm diameter aggregates this increase was due to a surface area effect, i.e., loss in porosity as a result of subdividing larger aggregates. Both surface area effects and increased porosity from root channels and fissures were required to explain the increase for clods between 5 and 1 cm diameter. An evaporation and a sorption technique were described and used to estimate the water content of aggregates at saturation, i.e., the intra-aggregate water content. The evaporation technique gave reliable results at specific rates of evaporation, but the sorption technique was not as useful. Clods and aggregates of the soil and of pumice samples did not fully saturate; entrapped air accounted for 25 to 27% of the total pore volume. Aggregates of 1 and 2.2 mm diameter and clods of 1.0 and 5.0 cm diameter took about 1, 1.7, 45, and 1000 seconds, respectively, to saturate. This rapid wetting would minimize differences in potential between inter- and intra-aggregate water during infiltration. (Sims - ISWS)
W76-07084

SPATIAL VARIABILITY OF THE LEACHING CHARACTERISTICS OF A FIELD SOIL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
J. W. Bigger, and D. R. Nielsen.
Water Resources Research, Vol. 12, No. 1, p 78-84, February 1976. 10 fig, 3 tab, 14 ref.

Descriptors: *Spatial distribution, *Leaching, *Soils, *Soil profiles, Salts, Pore water, Solutes, Infiltration, Diffusion, Sampling, Infiltration rates, On-site investigations, Soil water.
Identifiers: Field soil, Water-soluble salts, Pore water velocity, Diffusion coefficient, Sampling sites.

Solute distributions within a soil profile during the leaching of water-soluble salts applied to the soil surface were measured at six depths to 182.4 cm within 20 subplots of a 150-ha field. Estimates of the pore water velocity based upon measures of solute displacement within each subplot and the entire field were found to be logarithmically normally distributed and in agreement with the volumetric measures of water infiltration rates. Such agreement was possible only because it was recognized that the observed values were not normally distributed and their mean values were calculated accordingly. The number of observations required to yield an estimate of the mean pore water velocity within a prescribed accuracy was shown to depend upon the nature and extent of the spatial variability of the field soil. For the field examined, 100 observations allowed the mean pore water velocity to be estimated within + or -50% of its true value. The functional relation between field-measured values of the apparent diffusion coefficient, also found to be logarithmically normally distributed, and pore water velocity was examined and interpreted in terms of solute distributions likely to be measured at specific sampling sites. (Roberts - ISWS)
W76-07089

ANIMAL WASTE CONTRIBUTION TO NITRATE NITROGEN IN SOIL,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5B.
W76-07188

PROPERTIES OF SOIL IN THE SAN FERNANDO HYDRAULIC FILL DAMS,
California Univ., Berkeley.
For primary bibliographic entry see Field 8D.
W76-07219

ACIDITY, ACID SULPHATE SOILS AND LIMING OF PADI FIELDS,
For primary bibliographic entry see Field 3C.
W76-07227

PREDICTING IONIC DISTRIBUTIONS IN LARGE SOIL COLUMNS,
New Mexico State Univ., University Park.
P. J. Wierenga, M. J. Shaffer, S. P. Gomez, and G. A. O'Connor.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1080-1084, November- December 1975. 8 fig, 1 tab, 13 ref.OWRT A-048-N MEX(3).

Descriptors: Irrigation effects, *Ions, *Soil profiles, *Soil chemistry, *Analytical techniques, *Distribution patterns, *Model studies, Chemical analysis, Evaluation, Soil analysis, Soil chemical properties, Soil physical properties, Drainage effects, Infiltration, Lysimeters, Instrumentation, Irrigation, Irrigation practice, Computer models, Soil water movement, *Return flow.
Identifiers: *Ionic distributions, Solute movement, Water flow models, Exchange equations, Plate model, Salt distribution, Rate theory.

The distribution of various cations and anions was measured with depth and time in a large lysimeter column periodically irrigated in saline water. Samples of the soil solution were removed with extraction cups placed at depths of 25, 50, 75, 100, 125, and 150 cm below the soil surface in the lysimeters. Observed ionic distributions were compared with calculated values obtained by combining transient water flow model with a chemical plate theory model. Good agreement was obtained in observing a predicted depth distribution profile for SO4(--), Cl(-), Na(+), and Ca(++). Soluble Mg(++) and HCO3(-) concentrations were overpredicted suggesting that further refinement of the chemical subroutine may be needed. (Henley - ISWS)
W76-07234

PREPARATION OF POLYESTER JACKETED SOIL COLUMNS AS PENETRATION, SUCTION PLATE AND GROUNDWATER LYSIMETERS, (IN GERMAN),
Goettingen Univ. (West Germany). Institut fuer Bodenkunde.
B. Homeyer, K. O. Labenski, B. Meyer, and A. Thormann.
Z Pflanzenernaehr Bodenkd. 136(3) p 242-245, 1973.

Descriptors: *Lysimeters, Groundwater, Soils, *Soil testing, Soil analysis, Methodology.
Identifiers: *Soil columns.

A simple and cheap preparation technique for long soil monolith lysimeters consists in forming columns of undisturbed soil out from the walls of soil pits by means of a steel cylinder, encasing the column with glassfiber mat and infiltrating this coat with polyester resin. Casing is also possible by simultaneous application of resin compounds and glassfiber as a mix spray. Imbedding steel slats in the polyester walls facilitates the transport. Descriptions are given how to make use of such columns as simple penetration lysimeters, suction plate, and groundwater lysimeter sets for studies of the water and bio-element balances of the soil.--Copyright 1975, Biological Abstracts, Inc.
W76-07272

MICROMORPHOLOGY OF HYDROMORPHIC SOILS OF IRRAWADDY RIVER DELTA, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
V. A. Obukhova, and K. N. Fedorov.
Vestn Mosk Univ Ser 6 Biol Pochvoved. 29(2), p 85-90, 1974.

Descriptors: *Clays, Soils, Geomorphology, Deltas, Rivers, Iron, Manganese, Cultivation, Soil profiles.
Identifiers: *Burma(Irrawaddy River Delta), Gleying, *Hydromorphic soils, Nodules, Paddy, *Burmese soils.

Permanent use of these Burmese soils for many years under paddy cultivation promoted surface gleying, accumulation of various kinds of Fe and Mn nodules, intensive biochemical decomposition of organic matter, the significant accumulation of oriented clays in meadow gley soils throughout the profile and in illuvial layers of degraded soils.--Copyright 1975, Biological Abstracts, Inc.
W76-07273

INFLUENCE OF FLOODING ON PH, OXIDATION-REDUCTION POTENTIAL AND SOIL PHOSPHORUS AVAILABILITY, (IN PORTUGUESE),
Instituto de Pesquisas e Experimentacao Agropecuarias do Sul, Pelotas (Brazil).
For primary bibliographic entry see Field 5C.
W76-07289

DIFFUSIVITY OF WATER IN A NON-SATURATED HETEROGENEOUS ENVIRONMENT, (IN FRENCH),
State Coll. of Agronomical Science, Gembloux (Belgium).
C. Debouche, S. Gaspar, and L. Sine.
J Hydrol (Amst). 22(1/2), p 35-51, 1974.

Descriptors: *Diffusivity, Diffusion, Flow, Equations, Soils, *Soil water, Environment.
Identifiers: *Heterogeneous soils.

The diffusivity of the flow equation for water in soil was solved numerically in a horizontal soil column for an outflow case. A comparison is made between the results from homogeneous and from heterogeneous soils. The local or mean evaluation of the diffusivity do not agree, in heterogeneous soils, with the true local or mean values.--Copyright 1975, Biological Abstracts, Inc.
W76-07290

PAVEMENT AND SOIL CHARACTERISTICS.
Transportation Research Board, Washington, D.C.
For primary bibliographic entry see Field 8D.
W76-07323

EFFECTS OF ANISOTROPIC VERSUS ISOTROPIC CONSOLIDATION IN CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TESTS OF COHESIVE SOILS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8G.
W76-07327

CAUSES OF SLAKING IN ARGILLACEOUS MATERIALS,
California Univ., Berkeley.
For primary bibliographic entry see Field 8G.
W76-07329

EFFECT OF AERATION ON MICROBIOLOGICAL PROCESSES IN FLOODED SOIL, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. of Microbiology and Virology.
A. N. Ilyaletdinov, and S. I. Suleimenova.
Mikrobiologiya. 43(1), p 141-145, 1974.

Descriptors: *Aeration, Microbiology, Flooding, *Soil microbiology, *Rice, Oxidation, *Organic matter, Aerobic conditions, Carbon, *Nitrogen, Crop production, Humus.
Identifiers: *Flooded soils, Organic carbon.

Microbial oxidation of soil organic matter under aerobic conditions at optimal humidity reduces the content of humus, total and easily hydrolyzed N. Losses of nutrient substances are proportional to the duration of aerobic incubation. Soils flooded immediately after the beginning of incubation had a higher biological activity and a higher content of organic C and N. The number of ammonifying and cellulose decomposing microorganisms decreases in the soil incubated under aerobic conditions as a result of a reduced content of easily hydrolyzed N. These results explain to some extent why rice crops are low following late sowing (end of May-beginning of June).--Copyright 1975, Biological Abstracts, Inc.
W76-07363

SURVIVAL OF LISTERIA MONOCYTOGENES IN SOIL AND WATER,
Michigan Univ., Ann Arbor. Dept. of Wildlife and Fisheries.
For primary bibliographic entry see Field 5C.
W76-07423

SOIL MOISTURE REGIME OF LOESSIAL SOILS IN WESTERN GERMANY AS AFFECTED BY ZERO-TILLAGE METHODS,
Goettingen Univ. (West Germany). Faculty of Agriculture.
W. Ehlers, and K. Baeumer.
Pak J Sci Ind Res. 17(1), p 32-39, 1974.

Descriptors: *Soil moisture, Europe, Loess, Soil types, Water storage, Infiltration, Porosity, Evaporation.
Identifiers: *Germany, Non-tillage.

Continued application of zero-tillage on structurally instable leossial soils resulted in reduced total porosity of the topsoil, in an increased structural homogeneity down the soil profile, and-due to enhanced earthworm activity-in a system of continuous large pores connecting the atmosphere with deeper soil layers. Conventionally tilled soils, though generally less densely packed than untilled soils, were more or less compacted at a depth of 25-30 cm, due to puddling and smearing actions during plowing. In consequence of the structural changes the water holding capacity of untilled soil was increased, yet the soil water tension was decreased as compared to tilled soils. Whereas in tilled soils, after heavy rainstorms, water infiltration was impeded by the plow pan, in untilled soil rainworm channels effected a rapid downward movement of rain water against the existing gradient of hydraulic potential. Thus run-off was decreased and water storage increased as compared to conventionally tilled soils. Also, near water saturation, the water conductivity of untilled soils was calculated to be greater than in tilled soils. Estimated losses by evaporation during rainless period were equal on both soils.--Copyright 1975, Biological Abstracts, Inc.
W76-07437

THE CONTAMINAION OF DUTCH SOILS WITH MERCURY AND A FEW OTHER HEAVY METALS,
Instituut Voor Toepassing Van Atoomenergie in de Landbouw, Wageningen (Netherlands).
For primary bibliographic entry see Field 5B.
W76-07450

2H. Lakes

COMPARATIVE STUDIES OF SOME INLAND SALINE AQUATIC ECOSYSTEMS IN NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W76-06805

RADIOECOLOGY OF WATER ORGANISMS, VOL. 2. DISTRIBUTION AND MIGRATION OF RADIONUCLIDES IN FRESHWATER AND SEA-WATER BIOCENOSES.
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5B.
W76-06861

SR90 IN WATER, BOTTOM, AND WATER ORGANISMS IN LATVIAN LAKES OF VARIOUS TYPES,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5B.
W76-06867

THE ROLE OF AQUATIC PLANTS IN THE MIGRATION OF SR90 IN SOME WATER RESERVOIRS OF THE LITHUANIAN SSR,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5B.
W76-06868

STUDY OF SR90/SR RATIO IN A LATVIAN SEASIDE LAKE,
Akademiya Nauk Latviiskoi SSE, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5C.
W76-06869

SR90/SR RATIO IN PLANKTON OF LATVIAN LAKES OF VARIOUS TYPES,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5C.
W76-06870

SR90 DISTRIBUTION IN WATER AND BOTTOM SEDIMENTS OF LATVIAN LAKES,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5B.
W76-06871

SORPTION OF SR90 BY BOTTOM SEDIMENTS OF A FRESHWATER LAKE,
Akademiya Nauk SSSR, Sverdlovsk, Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 5B.
W76-06872

RATIO BETWEEN CS137 AND K ACCUMULATION COEFFICIENTS IN FRESHWATER ORGANISMS,
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii
For primary bibliographic entry see Field 5C.
W76-06873

NATURAL RADIOELEMENTS IN CONTEMPORARY BOTTOM SEDIMENTS OF ESTONIAN LAKES,
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
For primary bibliographic entry see Field 5B.
W76-06875

ON ACCUMULATION OF SR90 AND CS137 BY SOME FISH SPECIES IN FRESHWATER RESERVOIRS,
Kazan Inst. of Biology (USSR).
For primary bibliographic entry see Field 5C.
W76-06876

DISTRIBUTION AND MIGRATION OF SR90 IN AN EXPERIMENTAL STILL WATER RESERVOIR,
Ministerstvo Zdravookhraneniya S.S.S.R., Moscow. Institut Biofiiki.
For primary bibliographic entry see Field 5B.
W76-06879

SOME DATA ON COMPARATIVE EVALUATION OF RADIOACTIVE AND CHEMICAL POLLUTION FACTORS IN FRESHWATER RESERVOIRS,
Scientific Research Inst. of Radiation Hygiene, Leningrad (USSR).
For primary bibliographic entry see Field 5B.
W76-06886

GUIDELINES FOR MONITORING SHORE PROTECTION STRUCTURES IN THE GREAT LAKES.
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 8B.
W76-06922

HORIZONTAL DIFFUSION CHARACTERISTICS IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
C. R. Murthy.
Journal of Physical Oceanography, Vol. 6, No. 1, p 76-84, January 1976. 9 fig, 5 tab, 6 ref.

Descriptors: *Diffusion, *Diffusivity, *Water circulation, *Dispersion, *Eddies, *Lake Ontario,

Great Lakes, Circulation, Currents(Water), Turbulence, Mixing, Movement, Mass transfer, Dyes, Fluorescent dye, Dye dispersion, Rhodamine, Lakes.
Identifiers: *Horizontal diffusion, Turbulent diffusion, Dye patches.

Experimental data on the diffusion of fluorescent dye patches were obtained in Lake Ontario, to study large-scale horizontal diffusion characteristics. In each experiment, a slug of water-soluble rhodamine dye solution was introduced at appropriate depths. The growth of the diffusing dye patch was followed up to 80 h after dye release, using fluorometric sampling. The data covered a length scale (i.e., patch size) of 100 m to 15 km and the corresponding eddy diffusivities varied from 100 to 1,000,000 sq cm/s. Several horizontal diffusion characteristics are constructed based on a simple theoretical framework. The longitudinal eddy diffusivity was found to be greater than the lateral eddy diffusivity by a factor of 5-10 during initial stages of diffusion and by a factor of 2-3 for long diffusion times. However, the combination of anisotropy of turbulence and vertical diffusion into the horizontal mean current produces an apparently distorted increase in longitudinal diffusion of the dye patch. Although the diffusion characteristics cannot be justified entirely from theoretical arguments, they could be viewed as purely statistical since they have been constructed from experimental data obtained in widely varying environmental conditions and provide useful guidelines for modeling practical diffusion problems. (Bender - ISWS)
W76-06929

STEADY WIND-DRIVEN CURRENTS IN A LARGE LAKE WITH DEPTH-DEPENDENT EDDY VISCOSITY,
Oak Ridge National Lab., Tenn.
A. J. Witten, and J. H. Thomas.
Journal of Physical Oceanography, Vol. 6, No. 1, p 85-92, January 1976. 8 fig, 2 tab, 10 ref. NSF DES72-01338 A03.

Descriptors: *Water circulation, *Currents(Water), *Turbulent flow, *Momentum transfer, *Great Lakes, Lakes, *Lake Ontario, Movement, Circulation, Depth, Mixing, Turbulence, Viscosity, Winds, Steady flow, Model studies.
Identifiers: *Eddy viscosity, Drift currents, Turbulent momentum transport, Lake circulation modeling.

The theory of steady wind-driven currents in shallow water was extended to the case of a spatially variable eddy viscosity. The theory was first applied to the case of a pure drift current in water of constant depth, and a good fit with observed data was obtained. Subsequently, the theory was applied to a simplified model basin (representing Lake Ontario). Results were given for a uniform surface wind stress for different values of the surface eddy viscosity and a constant, and compared with results for a constant eddy viscosity. Although the vertically-integrated mass flux is fairly insensitive, the three-dimensional current pattern is fairly sensitive to the variations in the eddy viscosity. The results for the exponential eddy viscosity showed deeper coastal 'jets' as well as a weak central current not found in the case of a constant eddy viscosity. The pattern of return flow is changed, and there are significant differences in the pattern of upwelling and downwelling. The results pointed out the importance of more accurate representations of turbulent momentum transport in lake modeling. (Bender - ISWS)
W76-06930

SPECIFIC CONDUCTANCE IDENTIFIES PERCHED AND GROUND WATER LAKES,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
C. F. Hawkinson, and E. S. Verry.
Research Paper NC-120, 1975. 5 p, 3 fig.

Descriptors: *Lakes, *Specific conductivity, *Water table, Limnology, Land management, Water quality, Maps, *Minnesota.

Lakes can be classified into perched, ground water, and transitional categories according to specific conductance values. The classification is confirmed with 10 years of water table measurements in 29 wells. Several applications of lake specific conductance values are discussed. (Forest Service)
W76-07023

TOPOGRAPHIC WAVES IN LAKE ONTARIO,
Woods Hole Oceanographic Institution, Mass.
G. T. Csanady.
Journal of Physical Oceanography, Vol. 6, No. 1, p 93-103, January 1976. 10 fig, 19 ref.

Descriptors: *Waves(Water), *Lakes, *Lake Ontario, *Lake shores, *Great Lakes, Topography, Winds, Circulation, Water circulation, Temperature, Thermocline, Limnology.
Identifiers: *Topographic waves, Kelvin waves, Rossby waves, Vorticity waves.

Properties of a topographic wave were calculated for an idealized shore zone model simulating the north shore of Lake Ontario. Observations at the Oshawa 'coastal chain' taken during the International Field Year on the Great Lakes were then scrutinized, concerning three flow-reversal episodes involving deep, barotropic currents. It was shown that the observed phenomena have characteristics very similar to those of the idealized topographic wave. A legitimate interpretation of the observed 12-16 day periodicities in longshore flow within the coastal zone of Lake Ontario is that they are caused by a combination of internal Kelvin waves and topographic waves. Although the speeds of these two kinds of vorticity waves are very similar in Lake Ontario, a careful consideration of the evidence clearly showed phase separation, particularly so late in the season when reduced density differences lead to a slowing down of internal Kelvin waves. (Sims - ISWS)
W76-07068

VARIATIONS IN THE LEVEL REGIME OF HIGHMOOR BOGS IN THE EUROPEAN USSR,
Ye. L. Balyasova.
Soviet Hydrology, Selected Papers, No. 5, p 281-292, 1974. 2 fig, 1 tab, 12 ref, 3 append. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 22, p 3-20, 1974.

Descriptors: *Bogs, *Water levels, *Marshes, Wells, Observation wells, Surveys, On-site investigations, Data processing, Wetlands, Peat, Mosses, Vegetation, Hydrologic properties, Hydrology.
Identifiers: *USSR.

One of the most important hydrologic characteristics of a bog, knowledge of which permits computing the other elements of the water regime (runoff, evaporation, and water storage in the peat), is its water level. Since it is simple to observe the water level in bogs, it is most practical to use these observations for hydrologic computations. Here observational data on water levels in 39 types of bog microlandscapes were analyzed and generalized. The results of the investigation lead to the following conclusions: (1) the invariability and constancy of mean annual, maximum, and minimum bog water levels of given probability have been proved for genetically similar microlandscapes, regardless of their location in bogs and the geographic location of the bogs themselves, making it possible to use the computed water-level characteristics of adequately studied bogs in engineering hydrologic computations for unstudied bogs of the same types in poorly accessible regions; (2) use of numerical methods makes it possible to establish the statistical homogeneity of samples of mean annual, maximum, and minimum bog water levels in genetically similar microlandscapes; and (3) combining homogeneous, independent samples of bog water levels for genetically similar microlandscapes increases the volume of information for computing the parameters of distribution curves. (Sims-ISWS)
W76-07077

DETERMINATION OF THE PERMEABILITY OF THE PEAT DEPOSIT OF A LOWMOOR BOG,
For primary bibliographic entry see Field 2G.
W76-07078

HYDROCHEMICAL REGIME AND CHEMICAL COMPOSITION OF OLIGOTROPHIC BOG WATERS,
For primary bibliographic entry see Field 5B.
W76-07079

LABORATORY INSTRUMENTS AND APPARATUS FOR INVESTIGATING THE THERMOPHYSICAL INTERACTION OF WATER WITH A FROZEN PEAT DEPOSIT,
For primary bibliographic entry see Field 2G.
W76-07080

OPERATIONAL CHARACTERISTICS OF THE DECCA LAMBDA (6F) POSITIONING SYSTEM OVER FRESH WATER,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
F. L. DeGrasse, and P. Brunavs.
International Field Year for the Great Lakes Technical Manual Series No. 7, 53 p, 20 fig, 2 tab, 4 ref. (1974).

Descriptors: *Navigation, *Surveys, *Great Lakes, *Lake Ontario, *Instrumentation, Evaluation, Bathymetry, Surveying instruments, Equipment, Lakes, International hydrological decade, Limnology.
Identifiers: *International Field Year for the Great Lakes.

Establishment of the DECCA LAMBDA (6f) positioning system for the International Field Year Great Lakes study of Lake Ontario and basin provided an excellent opportunity to evaluate the equipment in the hyperbolic mode and to determine phase lag effect on electromagnetic waves in a fresh water environment. A number of calibrations/evaluations were carried out throughout the Field Year under varying meteorological and land-sea media conditions to determine a more accurate figure for Velocity of Propagation of radio waves over fresh water and its application to electronic positioning in similar fresh water bodies. The bathymetric survey of Lake Ontario was described together with the automated collecting, processing and portrayal of the data. This survey is the first major effort at metrication in the Great Lakes. Phase lag observations with the hyperbolic Decca system over water of Lake Ontario were described and a comparison was made with theoretically obtained values. Satisfactory agreement indicated that the theoretical model is reliable and can be used for prediction of phase velocities in other freshwater lakes. (Sims - ISWS)
W76-07091

STUDIES ON METABOLIC ACTIVITY OF PLANKTONIC BACTERIA ISOLATED FROM THREE LAKES,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-07097

AERATION AS A LAKE MANAGEMENT TECHNIQUE,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5C.

W76-07103

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 1. SURFACE WATER RECORDS--VOLUME 1.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-07121

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 5. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--VOLUME 1. HUDSON BAY BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-07122

CONTROL OF THE SEA LAMPREY (PETROMYZON MARINUS) IN LAKE SUPERIOR, 1953-70,
Fish and Wildlife Service, Marquette, Mich.
For primary bibliographic entry see Field 8I.
W76-07250

WATER CLARITY RECORDS FROM TWENTY-TWO NEW ZEALAND LAKES,
New Zealand Oceanographic Inst., Wellington.
J. Irwin.
N Z J Mar Freshwater Res. 8(1), p 223-227, 1974.

Descriptors: *Lakes, *Light penetration, Secchi disks, *Deep water, Depth, Water quality.
Identifiers: *New-Zealand.

Water clarity values from 22 New Zealand lakes show that the largest and deepest have the highest values, except those affected by glacial slit or humic coloration. Smaller and shallower lakes have lower water clarity values. (Observations were made with a Secchi disc of 20 cm diameter divided into black- and white-painted quadrants).--Copyright 1974, Biological Abstracts, Inc.
W76-07253

COMPARATIVE PRIMARY PRODUCTIVITY OF TWO FLOOD CONTROL RESERVOIRS IN THE SALT VALLEY WATERSHED OF EASTERN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-07254

EUTROPHICATION OF SMALL RESERVOIRS IN EASTERN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-07258

THE FINAL STAGES OF SOME SMALL PONDS IN SW GEKMANY, (IN GERMAN),
Tuebingen Univ. (West Germany). Lehrbereich fuer Spezielle Botanik.
For primary bibliographic entry see Field 5C.
W76-07269

POPULATION OF GAMMARUS LACUSTRIS SARS (CRUSTACEA, AMPHIPODA) IN LAKE SEVAN DURING ITS DECREASE, (IN RUSSIAN),
Akademiya Nauk Armyanskoi SSR, Srevan. Hydrobiology Station.
A. G. Markosyan.
Biol Zh Arm. 27(1), p 28-35, 1974.

Descriptors: *Water level fluctuations, Lakes, Moss, *Crustaceans, *Amphipoda, Vegetation, Fecundity, Animal population.
Identifiers: *Gammarus-Lacustris, *USSR(Lake Sevan).

Investigation (1947-1967) established that the rate of lowering the level of Lake Sevan (USSR) adversely affected the development of the bottom vegetation and its related animal community, the members of which were the food components of the amphipods. This zone, which in the past had optimal feeding conditions for crustaceans, was disturbed markedly and its food resources decreased. The data on the reduction of the fecundity of the amphipods and decrease of the average size of individuals in the population indicated a deterioration of the habitat of amphipods in the lake and especially the feeding conditions. The fate of the population of G. lacustris in Lake Sevan after stabilization of the level, which began in the late 1960s, will depend on how quickly restoration of the 'moss and chara' zone and the rich phyto- and zoocoenoeses related with it occurs.--Copyright 1974, Biological Abstracts, Inc.
W76-07270

MICROBIOLOGICAL PRODUCTION OF HYDROGEN SULPHIDE IN THE VEISOVO LAKE (SLAVYANSK LAKES), (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institute Biochemistry, Physiology and Microorganic.
For primary bibliographic entry see Field 5C.
W76-07278

SEASONAL DYNAMICS OF BACTERIOPLANKTON OF THE KAPCHAGAL RESERVOIR IN THE THIRD YEAR OF ITS FILLING, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-07279

THE EUTROPHICATION OF THE TITISEE AND ITS CONSEQUENCES FOR THE POPULATION DYNAMICS OF ZOOPLANKTON: I, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-07281

MICROZOOPLANKTON OF LAKES OBELIJA, SLAVANTAS, GALSTAS AND DUSIA, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parizitologii.
For primary bibliographic entry see Field 5C.
W76-07283

CONTRIBUTION TO THE KNOWLEDGE OF THE ALGAL FLORA OF A FISHPOND IN BRATISLAVE-ZELEZNA STUDNICKA, (IN CZECH),
Slovenske Polnohospodarske Akademie, Bratislava (Czechoslovakia). Laboratorium Rybarstva.
For primary bibliographic entry see Field 5C.
W76-07287

CONTENT OF HETEROTROPHIC MICROORGANISMS IN WATER OF LAKE BAIKAL, (IN RUSSIAN),
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 5C.
W76-07302

DECOMPOSITION OF NITROGENOUS ORGANIC SUBSTANCES IN SURFACE WATERS, (IN RUSSIAN),
Hygieny a Epidemiologie, Prague (Czechoslovakia). Institut.
For primary bibliographic entry see Field 5C.
W76-07303

A REPORT ON IRON DEPOSITS IN LAKE CHAD (1970-1973), (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena).
For primary bibliographic entry see Field 5B.
W76-07304

ZOOPLANKTON OF SMALL LAKES OF THE EASTERN PART OF THE BOLSHEZEMELSKAYA TUNDRA, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-07307

THE EFFECT OF MEASURES REDUCING EUTROPHICATION ON THE PHYTOPLANKTON OF THE REITHER SEA IN TYROL (AUSTRIA), (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-07308

RESTORATION OF A EUTROPHICATED LAKE (REITHER SEA, TYROL, AUSTRIA), (IN GERMAN),
Innsbruck Univ. (Austria). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W76-07309

PHYTOPLANKTON OF SOME PONDS AND LAKES OF DAGESTAN ASSR, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva Makhachkala (USSR).
For primary bibliographic entry see Field 5C.
W76-07311

DISTRIBUTION, PHYTOCENOLOGY AND PRODUCTIVITY OF NYMPHAEACEAE IN RESERVOIRS OF THE DNIEPER CASCADE, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev (USSR). Central Republican Botanical Garden.
For primary bibliographic entry see Field 5C.
W76-07314

SOME REGULARITIES OF SHORELINE-WATER FLORA DISTRIBUTION IN FLOODLAND LAKES OF THE LOWER AMUR, (IN RUSSIAN),
Ussuriisk Pedagogicheskii Institut (USSR).
V. S. Shaga, and N. I. Shaga.
Izv Sib Otd Akad Nauk SSSR Ser Biol Nauk. 3, p 36-40, 1973.

Descriptors: *Lakes, *Distribution, Classification, Aquatic plants, Water level fluctuations.
Identifiers: Amur, Floodland, Shoreline, USSR(Lake Udyl).

The 50 spp. of hydrophytes and hydatophytes studied were classified as 5 groups: plants rooted in the soil of the body of water with their vegetative and reproductive organs above the water line (19 spp.), or floating on the water surface (14 spp.), or totally submerged (10 spp.); plants not rooted which are totally submerged in water (4 spp.) or floating freely on the surface (3 spp.). Specific information on the ecology of plants on the shoreline and in the water of Lake Udyl (USSR) is given. The proposed construction of a canal from the Amur River to Tabo bay will decrease the water level in these lower Amur lakes and affect the flora by changing the area into floodland meadows.--Copyright 1975, Biological Abstracts, Inc.
W76-07315

DENSITY AND BIOMASS OF PHYTOPLANKTON POPULATIONS IN AN APENNINE LAKE (LAKE SANTO PARMENSE) DURING THE WINTER FREEZE, (IN ITALIAN),
Parma Univ. (Italy). Laboratorio di Ecologia.
For primary bibliographic entry see Field 5C.

W76-07316

HEAVY METAL CONTENT IN THE SEDIMENTS OF THE SOUTHERN PART OF THE COEUR D'ALENE LAKE,
Idaho Univ., Moscow. Dept. of Chemistry.
D. Maxfield, J. M. Rodriguez, M. Buettner, J. Davis, and L. Forbes.
Environ Pollut. 6(4), p 263-266, 1974.

Descriptors: *Water pollution sources, Idaho, Spectroscopy, *Heavy metals, Sediments, Lead, Zinc, Cadimum, Copper, Analysis.
Identifiers: *Coeur-D'Alene lake(Idaho).

Sediment samples were collected in the southern part of the Coeur d'Alene lake in Northern Idaho. They were analyzed for heavy metals (Pb, Zn, Cd, and Cu) using atomic absorption spectroscopy. A survey of heavy metal concentration in the sediments was carried out in order to estimate the extent and degree of heavy metal contamination in the southern part of the Couer d'Alene lake.--Copyright 1975, Biological Abstracts, Inc.
W76-07394

FORMATION OF THE FISH FAUNA OF THE CHIMKURGAN RESERVOIR IN THE BASIN OF THE KASHKADAR'YA RIVER (UZBEK SSR, USSR), (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.
A. A. Amanov.
Izv Akad Nauk Tadzh SSR Otd Biol Nauk. 1, p 59-61, 1974.

Descriptors: *Carp, Reservoirs, Fish food organisms, Growth rates, Rivers, Fish population.
Identifiers: Barbus-Capito-Conocephalus, Carassius-Auratus-Gibelio, Chimkurgan, Reservoir, Kashka-Darya, Ophiocephalus-Argus-Warpachovskii, *USSR, Uzbek-SSR, Varicorhinus-Capoeta-Heratensis.

Investigations established that the commercial fish fauna of the Chumkurgan reservoir in the middle course of the Kashka-Dar'ya River in the Uzbek SSR (USSR) includes the pond crucian carp (Carassius auratus gibelio), Amur snakehead (Ophiocephalus argus warpachovskii), Samarkand khramulia (Varicorhinus copoeta heratensis), Turkestan barbel (Barbus capito conocephalus) and common carp (Cyprinus carpio). Of the acclimatized fishes maximum acceleration in growth was observed in pond crucian carp and Amur snakehead, since there is sufficient food in this reservoir for them. The fish population of the reservoir was formed due to local fish species of the Kashka-Dar'ya and fish species acclimatized and introduced from other waters of the USSR.--Copyright 1975, Biological Abstracts, Inc.
W76-07399

STUDIES ON THE BIOLOGY OF DREISSENA POLYMORPHA PALLAS IN LAKE CONSTANCE, (IN GERMAN),
Freiburg Univ. (West Germany). Limbologisches Institut.
For primary bibliographic entry see Field 5C.
W76-07400

WHAT SHOULD BE DONE WITH HAUGATJERN, (IN NORWEGIAN),
Tromsoe Museum (Norway). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-07401

STUDY OF THE ZOOPLANKTON OF SMALL LAKES OF THE LOWER REACHES OF THE ISFAIRAMSAI RIVER, (IN RUSSIAN),
Ferganskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
A. M. Mukhamediev, and O. U. Umarov.
Uzb Biol Zh. 18(2), p 51-54, 1974.

Descriptors: Zooplankton, Lakes, Biomass, Fisheries, Cladocera, Copepoda, Asia, Rotifers.
Identifiers: *Bosmina-longirostris, Isfairmasai River, *Moina-veberi, Rotatoria, *USSR(Uzbek-SSr).

Information is presented on the hydrology and hydrobiology of lakes Pastkishlak and Katta-Kul located in the old channel of the Isfairamsai River in the Fergana district of the Uzbek SSR (USSR). These lakes contain 28 spp. of zooplankton (17 spp. of Rotatoria, 7 spp. of Cladocera and 4 spp. of Copepoda). The bulk of the zooplankton biomass was composed of Bosmina longirostris and Moina veberi. The lakes can be used for fishery purposes.--Copyright 1975, Biological Abstracts, Inc.
W76-07412

FORMATION ASPECTS OF ZOOPLANKTON SPECIES COMPOSITION IN TWO DIFFERENT-TYPE RESERVOIRS IN EASTERN GEORGIAN SSR, (IN RUSSIAN),
Tbilisskii Gosudarstvennyi Universitet (USSR).
For primary bibliographic entry see Field 5C.
W76-07413

STUDY OF THE MACROZOOBENTHOS OF FLOOD PLAIN LAKES OF THE VAKHSH RIVER, (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.
F. Akhrorov.
Izv Akad Nauk Tadzh SSR Otd Biol Nauk. 1, p 54-58, 1974.

Descriptors: Lakes, Asia, *Benthos, *Aquatic insects, Diptera, *Mollusks, Mayflies, Reeds, Rivers, Productivity.
Identifiers: Amur, Coleoptera, Corixidae, Floodplain lakes, Odonata, Oligochaeta, Tadzhik-SSR, Trichoptera, *USSR(Vakhsh River).

An investigation of the benthos of the floodplain lakes of the Vakhsh River in the Tadzhik SSR (USSR) showed that the benthos consists mainly of larvae of aquatic insects (Chironomidae, Odonata and Ephemeroptera) and mollusks (46 spp. and forms). The most abundant and diverse group was the midges (Chironomidae) with 31 forms. The other groups--Oligochaeta, Trichoptera, Corixidae, Coleoptera--were identified incompletely. To improve the habitat and increase the productivity of the benthos of lakes of the lower reaches of the Vakhsh destroying the large masses of reeds by mowing and by introducing the herbivorous white amur is recommended.--Copyright 1975, Biological Abstracts, Inc.
W76-07414

MASS FORMS OF CHIRONOMID LARVAE FROM THE KAYRAKKUM RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.
F. Akhrorov.
Izv Akad Nauk Tadzh SSR Otd Biol Nauk. 2, p 73-78, 1974.

Descriptors: *Diptera, *Aquatic insects, Reservoirs, *Fish food organisms, Fish diets, Larvae.
Identifiers: Cricotopus-Silvestris, Cryptochironomus-Burganadzeae, Cryptochironomus-Conjugens, Cryptochironomus-Crassiforceps, Einfeldia-Pagana, Pelopia-Sp, Procladius-Ferrugineus, Tadzhik-SSR, Tanytarsus-Gregarius, *USSR(Kayrakkum Reservoir).

Based on material gathered from 1963-1968 in the Kairakkum Reservoir, Tadzhik SSR (USSR), dates and locations of finds and data of the biotypes, quantities, feeding habits and role as food for various fish are given for 8 Chironomidae (Diptera) species: Tanytarsus ex. gr. gregarius, Cryptochironomus burganadzeae, C. crassiforceps, C. ex.gr. conjugens, Einfeldia f. l. pagana, Cricotopus ex. gr. silvestris, Pelopia sp. and Procladius ferrugineus. These species are important as the basic mass of benthic fauna in the reservoir and comprise 75-80% of the food of bottom-feeding fish.--Copyright 1975, Biological Abstracts, Inc.
W76-07418

BIOLOGY OF THE RUDD SCARDINIUS ERYTHROPHTHALMUS (L) IN IRISH WATERS,
Inland Fisheries Trust, Dublin (Ireland).
M. Kennedy, and P. Fitzmaurice.
Proc R Ir Acad Sect B. 74(18), p 245-303, 1974.

Descriptors: Fish physiology, Larvae, Europe, Spawning, Fish reproduction, Bacteria, Algae, Lakes, Ponds, *Fish population, Aquatic insects, Invertebrates.
Identifiers: Abramis-Brama, Acanthocephala, Caddis-Fly, Chironomid, Cladocera, Corixidae, Posthodiplostomulum-Cuticola, *Rudd, Rutilus-Rutilus, Scardinius-Erythrophthalmus, *Ireland.

Material from 173 Irish waters included collections of eggs, larvae, post-larvae, fry, juveniles and adult rudd. The rudd is probably an introduced species in Ireland. It spawns mainly from late May to early July in weedy freshwater situations, usually close to the shore. Irish rudd eggs measure 1.375-1.75 mm in diameter; they are adhesive, transparent and colorless or pale yellow. The usually hatch in 5-7 days. The 1st food of the larval rudd is chiefly unicellular algae. By the time the post-larvae attain a length of about 1 cm they have begun to feed mostly on Cladocera, which are their main diet for the 1st 2 yr of life, though chironomid larvae and other invertebrates are also eaten. The diet of older rudd consists mainly of insects of various kinds taken at or close to the surface, together with filamentous algae and the young shoots of vascular plants. Corixids and invertebrates such as Gammarus, Asellus and caddis larvae (mostly picked off the weeds) are also eaten. The rudd is a long-lived, slow-growing fish; examples of rudd up to 17 yr old were examined. The fastest-growing rudd are found in limestone lakes of upwards of 80 acres in area. Small, weedy ponds often hold large populations of stunted rudd. Male rudd usually spawn for the 1st time 3 yr after they were spawned; the females usually spawn for the 1st time when 4 yr old. Hybrids between rudd and bream Abramis brama are common. Hybrids between rudd and roach Rutilus rutilus are much less frequent. The commonest parasites of Irish rudd are acanthocephalans and the trematode Posthodiplostomulum cuticola (black spot). Rudd appear to be relatively resistant to most bacterial diseases. They are hardy and can survive in water of poor quality.--Copyright 1975, Biological Abstracts, Inc.
W76-07419

SURVIVAL OF LISTERIA MONOCYTOGENES IN SOIL AND WATER,
Michigan Univ., Ann Arbor. Dept. of Wildlife and Fisheries.
For primary bibliographic entry see Field 5C.
W76-07423

HYGIENIC CHEMICAL STUDIES ON WATER QUALITY OF THE MOAT OF IMPERIAL PALACE: I. RELATIONSHIP BETWEEN SEASONAL WATER QUALITY AND MICROFLORA IN THE MOAT. (IN JAPANESE),
National Inst. of Hygienic Sciences, Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W76-07426

HYGIENIC CHEMICAL STUDIES ON WATER QUALITY OF THE MOAT OF IMPERIAL PALACE: II. RELATIONSHIP BETWEEN

WATER QUALITY AND HORIZONTAL INSOLATION INTENSITY, (IN JAPANESE),
National Inst. of Hygienic Sciences, Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W76-07427

A TEST OF THE HYPOTHESIS THAT ABIOTIC PHOSPHATE COMPLEXING INFLUENCES PHOSPHORUS KINETICS IN EPILIMNETIC LAKE WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W76-07429

TURNOVER AND UPTAKE OF DISSOLVED PHOSPHATE IN FRESHWATER: A STUDY IN LAKE KINNERET,
Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
For primary bibliographic entry see Field 5C.
W76-07430

2I. Water In Plants

RADIOACTIVE ISOTOPES IN THE SYSTEM WATER--FRESHWATER PLANTS,
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 5B.
W76-06866

ESTIMATION OF THE WATER HYDRATION IN WINTERING WHEAT LEAVES BY PROTON MAGNETIC RESONANCE,
Department of Agriculture, Ottawa (Ontario). Chemistry and Biology Research Inst.
F. D. H. MacDowall, and G. W. Buchanan.
Can J Biochem. 52(7), p 652-654, 1974.

Descriptors: *Wheat, *Leaves, *Estimating, Hydration, *Water of hydration, Frost.
Identifiers: Triticum-aestivum, *Proton magnetic resonance.

Water of hydration in whole tissues of wheat (Triticum aestivum) leaf sheaths was estimated by Kuntz' PMR method as the fraction of water that was withheld by macromolecular restraint from ice formation. The tissues bound up to 0.5 g water/gram dry weight. At -25 degrees C, which killed all tissues, the proton signals of unfrozen water were of greater magnitude from tissues and press sap of more hardy (frost resistant) plant material.--Copyright 1974, Biological Abstracts, Inc.
W76-07226

THE INTRODUCED ASIATIC CLAM, CORBICULA, IN CENTRAL ARIZONA RESERVOIRS,
East African Agriculture and Forestry Research Organization, Nairobia (Kenya).
J. N. Rinne.
Nautilus. 88(2), p 56-61, 1974.

Descriptors: *Reservoirs, *Clams, *Arizona, Turbidity, *Biomass, Predation.
Identifiers: Asiatic clam, Corbicula.

Horizontal and vertical density and biomass of Corbicula in 2 central Arizona reservoirs were estimated employing m2 quadrats and Ekman dredge sampling. Concentrations of clams increased with depth of water and, down-lake from inflow areas were characterized by greater turbidity (suspended sediment). Densities were highest on rock-rubble slopes and increased directly with complexity of substrate. Food supply, substrate, turbidity and perhaps fish predation are probably important factors in determining the density and biomass of clams in the 2 reservoirs.--Copyright 1974, Biological Abstracts, Inc.
W76-07251

THE INFLUENCE OF MOISTURE STRESS ON LIRIODENDRON TULIPIFERA L. SEEDLINGS,
Virginia Polytechnic Inst. of State Univ., Blacksburg. Dept. of Forestry and Forest Product.
P. E. Pope, and H. A. I. Madgwick.
Ann Bot (Lond). 38(155), p 431-439, 1974.

Descriptors: *Trees, *Deciduous trees, *Moisture stress, *Soil-water-plant relationships, *Plant growth, Seeds, Leaves.
Identifiers: Liriodendron-Tulipifera, *Seedlings, *Yellow poplar.

A comparison of yellow poplar seedlings subjected to available moisture ranging from 100%-20% of field capacity in 2 separate experiments (a soil study and a solution study) indicated that total dry matter production, stem height, total leaf area and area of individual leaves, decreased with increased moisture stress. Differences in unit leaf rate (ULR) were primarily responsible for final plant size. Leaf area: weight ratio was affected by the method of induced stress. As stress increased the ratio increased in the soil study but decreased in the solution study. The number of leaves produced was unaffected by stress, except at the most severe stresses. The number of senescent leaves increased as moisture stress increased. The allocation of new growth was unaffected by either moisture stress or time and decreased in order of root, foliage, stem for the soil grown plants and foliage, root, stem for the solution grown plants. ULR and relative growth rate (RGR) were reduced by both moisture stress and time. A growth simulation of the soil-grown plants based on results from the solution moisture stress experiment predicted the final plant dry weight within 12% and leaf area within 7% of the actual values.--Copyright 1974, Biological Abstracts, Inc.
W76-07259

EFFECTS OF SILICONE ANTITRANSPIRANT ON WOODY PLANTS,
Wisconsin Univ., Madison. Dept. of Forestry.
For primary bibliographic entry see Field 2D.
W76-07260

WATER TRANSPORT IN PLANTS: MECHANISM OF APPARENT CHANGES IN RESISTANCE DURING ABSORPTION,
Illinois Univ. at Urbana-Champaign. Dept. of Botany.
J. S. Boyer.
Planta (Berl). 117(3), p 187-207, 1974.

Descriptors: *Absorption, Water uptake, *Water requirements, *Plant growth, Transpiration, Leaves.
Identifiers: Helianthus-Annuus.

Leaf water potentials were measured at various rates of water absorption in whole plants and detached leaves of well-watered Helianthus annus L. The experiments were conducted in the steady state, where changes in leaf hydration did not affect the measurements but both the transpiration and growth components of absorption could be observed. The resistance at low fluxes was about 30 times the resistance at high fluxes. Most of the change took place in the leaves, since similar changes could be demonstrated in detached leaves. Measurements of rates of water movement in and out of the protoplasm were made when gradients in water potential between the protoplasts and the water source were varied. The high temperature sensitivity of efflux confirmed that the leaf protoplasts limited flow in these experiments. When the edge of the leaf was excised and flow occurred primarily through the vascular system of the leaf, the resistance was much lower than in the protoplasts. Calculations based on a model of water transport showed that the protoplast resistance was almost 30 times larger than the resistance of the path leading from the soil to the leaf protoplasts. The decrease in resistance of the leaves with increasing rates of absorption was attributed to a decrease in water movement in an out of leaf cells, which involved a high resistance, and an increase in movement around the leaf protoplasts, which involved a low resistance. Since the experiments were conducted at the steady state, the high resistances were apparent at low rates of flow where only growth occurred, whereas the low resistances could be observed at high rates of flow because growth did not occur and flow consisted solely of transpiration. Because of the high resistance of the protoplast pathway, leaf water potentials were governed more by protoplast water movement than by transpiration over a considerable range of rates of water absorption. This may explain some of the differences in earlier work on leaf water potentials and water transport.--Copyright 1974, Biological Abstracts, Inc.
W76-07265

DATA ON THE STUDY OF AMPHIBIAN FOOD IN THE REGION OF THE MIDDLE FLOW OF THE SEVERSKY DONETS RIVER, (IN RUSSIAN),
Kharkov State Univ. (USSR).
S. I. Medvedev.
Vestn Zool. 1, p 50-59, 1974.

Descriptors: *Amphibians, Rivers, *Bioassays, Aquatic animals, Ecology, Fish food organisms.
Identifiers: Bombina-Bombina, Bufo-Bufo, Bufo-Viridis, Pelobates-Fuscus, Rana-Esculenta, Rana-Ridibunda, Rana-Terrestris, *USSR(Seversky Donets River).

An analysis was made of food from the stomachs of the amphibians Rana esculenta L., R. ridibunda Pall., R. terrestris Andr., Bufo viridis Laur., B. bufo L., Pelobates fuscus Laur. and Bombina bombina L. collected in the summers of 1955-1958 in the valley of the Seversky Donets River at the Zmievkskian Biostation of Kharkov University (USSR). The species composition of animals found in the amphibians stomachs was determined and aspects of their ecology are discussed. The economic value of the food species is also mentioned.--Copyright 1974, Biological Abstracts, Inc.
W76-07271

WATER REGIME AND CONTENT OF PHOSPHORUS COMPOUNDS OF ACID-SOLUBLE FRACTION IN COTTON LEAVES AT DIFFERENT WATER-SUPPLY LEVELS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
N. S. Petinov, Kh. S. Samiev, and K. G. Marfina.
Fiziol Biokhim Kul't Rast. 6(1), p 9-15, 1974.

Descriptors: *Phosphorus, *Cotton, Leaves, *Water supply, Acids, Respiration.

Respiration intensity and synthetic activity of leaves were at a higher level in the wilt-resistant cotton Tashkeni 2' than in 108-F. With severe and long soil drought (soil moisture 46% of field capacity in Tashkent 2) a sharp drop was observed in the organic P content which was not restored by the addition of water. This indicates a deep disturbance not only in water-exchange but also in the protoplasmatic structures.--Copyright 1975, Biological Abstracts, Inc.
W76-07276

STUDIES ON THE MOVEMENT OF SALMON AND TROUT FRY AND INVERTEBRATES INTO FLOODED AREAS, (IN NORWEGIAN),
Zoologisk Museum, Oslo (Norway).
A. Lillehammer.
Fauna (Oslo). 27(2), p69-73, 1974.

Descriptors: *Salmon, *Trout, *Invertebrates, *Aquatic insects, Water level fluctuations, *Fry, Productivity.
Identifiers: Flooded area, *Norway.

In the Suldalslagen River, where there is great variation in the watercourse, young salmon and trout follow the variations in the water level and move up into flooded areas. They also move into small streams in June and July. Territorial occupation seems to be of short duration at this time. The invertebrate fauna, mostly insects, also rapidly colonizes flooded areas and the fry have a good supply of suitable food. Variations in the water level may have a positive effect on the productivity of the rivers.--Copyright 1975, Biological Abstracts, Inc.
W76-07285

THE DESIGNATION OF TWO ECOLOGICAL GROUPS OF AQUATIC INVERTEBRATES, (IN GERMAN),
Eotovs Lorand Univ., Budapest (Hungary). Inst. for Systematic Zoology.
A. Berczik.
Opusc Zool (Budap). 12(1/2), p 33-41, 1972.

Descriptors: *Invertebrates, Diptera, Aquatic insects, Life cycles, Ecology.
Identifiers: Ephemeroptera, Odonata, Plecoptera, Trichoptera, Holohydrobionts, Hemihydrobionts.

Insect species of which only the developmental stages are aquatic are characteristic of the invertebrate fauna of inland waters. From the coenological and energy turnover points of view these species differ from organisms which are aquatic during their entire life cycle and can be segregated without regard to systematic categories. Species or organisms spending their entire life in water are herein designated as holohydrobionts, and species or organisms aquatic only during their developmental stages (among the holomorphotic insect groups, e.g. Ephemeroptera, Odonata, Plecoptera, Trichoptera, Diptera, etc.) as hemihydrobionts. The justification of this categorization rests on ecological, coenological and energy turnover arguments.--Copyright 1975, Biological Abstracts, Inc.
W76-07286

PLANTING SHRUBS AND HALF-SHRUBS IN MOISTURE STORING FURROWS, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Institut Botaniki.
For primary bibliographic entry see Field 4A.
W76-07288

THE EFFECT OF WATER STRESS ON THE EXUDATION OF CARBOHYDRATES BY THE ROOTS OF PICEA ABIES (L.) KARST AND OTHER YOUNG CONIFERS, (IN GERMAN),
Technische Universitaet, Dresden (East Germany). Bereich Biologie.
M. Tesche.
Flora (Jena). 163(1/2), p26-36, 1974.

Descriptors: *Carbohydrates, *Conifers, Drought, Roots, Moisture content, Soils.
Identifiers: Larix-Decidua, Larix-Gmelinii-Var-Japonica, *Picea-Abies, Picea-Omorika, Pinus-Nigra, Pinus-Sylvestris, Pseudotsuga-Menziesii, *Water stress.

When seedlings with roots exposed of Picea abies, Pseudotsuga menziesii (Mirb.) Franco, Larix decidua Mill., L. gmelinii var. japonica (Maxim et Regel) Pilg., Pinus sylvestris L., Pinus nigra Arnold, and Picea omorika (Panc) Purk. are subjected to water stress, exudation of carbohydrates by the roots is strongly increased. The increase of carbohydrate exudation correlates with the degree of damage caused to the water-stressed plants. The effects of the duration of water stress, age of plant and soil drought of the site on exudation was investigated and besides carbohydrates P compounds as well as UV light absorbing substances were analyzed in the exudates. The results show that the quantity of exudates grows with increasing duration of water stress. Older plants exude large quantities of carbohydrates after water stress that younger ones, and soil drought just as air drought encourages exudation of carbohydrates.--Copyright 1975, Biological Abstracts, Inc.
W76-07299

THE HYPORHEIC FAUNA IN THE CATCHMENT OF THE OLTETZ-RIVER, (IN GERMAN),
Univ. Craiova, Craiova, Rom. Craiova Univ. (Rumania).
I. Rogoz.
Arch Hydrobiol Supplementb. 44(3), p 318-329, 1974.

Descriptors: Rivers, Watersheds(Basins), Drainage, Flood plains.
Identifiers: Bathynella-Motrensis, *Hyporheic fauna, *Romania(Oltetz River).

The hyporheic fauna of the Oltetz-River catchment during 1968-1970 is described. The composition of the fauna differs in the zones of the drainage, being most diverse in the mountain-zone, more uniform in the hill-zones and different in the plain-zone. The presence of Bathynella motrensis Serban known until now only from the Motru-River (Romania) is recorded.--Copyright 1975, Biological Abstracts, Inc.
W76-07305

INVESTIGATIONS ON THE CO2 BALANCE OF SUBMERGED HIGHER WATER PLANTS IN RUNNING WATER BY MEANS OF A MOBILE LABORATORY FOR INFRARED GAS ANALYSIS, (IN GERMAN),
Technische Universitaet, Dresden (East Germany). Bereich Hydrobiologie.
W. Horbach, L. Hornig, and G. Weise.
Int Rev. Gesamten Hydrobiol. 59(1), p 17-29, 1974.

Descriptors: *Carbon dioxide, Aquatic plants, *Submerged aquatic plants, Phytoplankton, River, Periphyton, Infrared radiation.
Identifiers: Amblystegium-riparium, Amblystegium-riparium-f-fontinaloide, *Germany, Hygrohypnum-ochraceum-f-obtusifolia, Potamogeton-trichoides, *Infrared gas analysis, Macrophytes.

The CO2-balance of Hygrohypnum ochraceum f. obtusifolia, Amblystegium riparium, A. riparium f. fontinaloides and of Potamogeton trichoides (Potamogetonaceae) was investigated by means of a transportable laboratory for IR gas analysis. The experiments were carried out in the river Mulde (E. Germany) by means of glass vessels exposed to the water body. The device for continuous measurement of CO2 exchange was operated by pumping air through the vessels containing 4 l of the water. The water plants exhibited a distinct day night rhythm of CO2 turnover. In some cases river water alone, which had percolated a tampon of Perlon fibers, also showed a considerable day night rhythm of CO2 turnover which had to be attributed to phytoplankton and suspended periphyton organisms, the activity of which is superimposed above the photosynthetic activity of the macrophytes. Measurement of the CO2 balance of submerged plants in water containing microphytes can only be attributable to the macrophytes if the time of exposition does not exceed one day.--Copyright 1975, Biological Abstracts, Inc.
W76-07312

RESPONSES OF ASTRAGALUS TENNESSEENSIS TO DROUGHT: CHANGES IN FREE AMINO ACIDS AND AMIDES DURING WATER STRESS AND POSSIBLE ECOLOGICAL SIGNIFICANCE,
Kentucky Univ., Lexington. School of Biological Sciences.
C. C. Baskin, and J. M. Baskin.
Oecologia (Berl). 17(1), p 11-16. 1974.

Descriptors: *Drought tolerance, *Amino acids, Climates, Ecology, Aquatic plants, Plant physiology.
Identifiers: *Amides, *Astragalus-Tennesseensis, Cedar habitat.

To better understand the adaptations of A. tennesseensis to its summer-dry cedar glade habitat, comparisons were made of the free amino acids and amides in leaves of drought- and nondrought-treated plants. No qualitative differences were detected; 13 free amino acids and 2 amides were identified. Water stressed plants showed a 115% increase in the total amount of amino acids and amides over nondrought stressed plants. Proline accounted for 30.1% of the increase and aspartic acid 37.1%. Water stress caused an increase in the 2 amides and in 11 of the 13 amino acids; alanine and serine decreased. Upon rewatering, the total amount of amino acids and amides quickly decreased. The ability of accumulate proline and aspartic acid may be of adaptive value to A. tennesseensis during short periods of drought.
W76-07397

VARIATION IN DROUGHT TOLERANCE IN EUCALYPTUS VIMINALIS LABILL,
Melbourne Univ., Parkville (Australia). School of Botany.
P. Y. Ladiges.
Aust J Bot. 22(3), p 489-500, 1974.

Descriptors: *Drought tolerance, Plant physiology, Stomata, Transpiration, Soil types.
Identifiers: *Eucalyptus-Viminalis.

Six-month-old seedlings of 2 low rainfall populations of E. viminalis showed greater resistance to desiccation and were less damaged by sustained drought than seedlings from 2 high rainfall populations. The more resistant seedlings did not simply avoid drought by quickly closing stomata, but were capable of maintaining relatively high rates of transpiration under moderate moisture stress. The 2 populations from moist habitats wilted at a higher relative turgidity of leaves than did the populations from the drier habitats. Furthermore, for populations from 1 dry habitat and 1 moist habitat, changes in relative turgidity in relation to water potential of leaves during drying were not significantly different. The greater tolerance of the low rainfall populations to drought is probably related to physiological resistance of the protoplasm to desiccation. Some differences in drought resistance were also noted between the 2 low rainfall populations. Young seedlings (3 mo. old) from a population on a deep basalt-derived soil were less resistant than young seedlings from a neighboring population on a shallower granite soil. The selection for drought tolerance at the granite site may have been more severe than at the basalt site.--Copyright 1975, Biological Abstracts, Inc.
W76-07398

STUDIES ON LEAF CHARACTERISTICS OF A CLINE OF EUCALYPTUS URNIGERA FROM MOUNT WELLINGTON TASMANIA: I. WATER REPELLENCY AND THE FREEZING OF LEAVES,
Institut National de la Recherche Agronomique, Versailles (France). Station Centrale d'Bioclimatology.
D. A. Thomas, and H. N. Barber.
Aust J Bot. 22(3), p501-512, 1974.

Descriptors: *Leaves, Plant physiology, *Australia, Seasonal, Evaporation.
Identifiers: Cline, *Eucalyptus-Urnigera, *Tasmania.

A cline in E. urnigera is described in which waxy glaucousness of the surfaces of leaves increases with altitude up Mount Wellington(Australia). Other leaf characteristics, such as adult shape, anthocyanin content of young leaves, and age of transition to adult leaf form, may also vary. If the leaves of E. urnigera with a dry surface are cooled, they freeze at a temperature of -8 to -10C. If the leaves are wet, they freeze at -2 to -4C. Such freezing always kills the leaves, whereas leaves which have supercooled below the true freezing point (-2 to -3C) escape damage. The ability of dry leaves to supercool may explain part of a selective advantage possessed by the gluacous water-repellant leaves of E. urnigera at high altitudes as compared with the green wettable leaves of plants at low altitudes. This selective advantage of water repellency is probably of ecological significance in protecting leaves from freezing when there are rapid falls in the ambient temperature below about -2 to -3C, either as radiation frosts or as short periods of snow after plant growth has started in the spring.--Copyright 1975, Biological Abstracts, Inc.
W76-07403

EXOTIC FISHES IN FRESH AND BRACKISH WATERS OF FLORIDA,
Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences.
W. R. Courtenay, Jr., H. F. Sahiman, W. W. Miley, II, and D. J. Herrema.
Biol Conserv. 6(4), p 292-302, 1974.

Descriptors: Florida, Brackish water, Fish.
Identifiers: Channelization, *Exotic fishes, Environmental impact statements.

At least 38 spp. and several hybrids of exotic fishes were found in fresh and brackish waters of Florida. At present 20 spp. and 5 hybrids are established in the form reproducing populations. The ornamental aquarium fish industry has been the major source of these introductions. Several methods of introductions are considered and recommendations presented toward preventing repetitions in the future. Future dispersal of exotics by channelization projects should become part of environmental impact statements.--Copyright 1975, Biological Abstracts, Inc.
W76-07421

2J. Erosion and Sedimentation

GUIDELINES FOR MONITORING SHORE PROTECTION STRUCTURES IN THE GREAT LAKES.
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 8B.
W76-06922

AUTOMATED WET SAND FEEDER FOR OPEN-CIRCUIT FLUMES,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
For primary bibliographic entry see Field 8B.
W76-06936

TIMBER HARVEST AS AN AGENT OF FOREST STREAM CHANNEL MODIFICATION,
Forest Service (USDA), Parsons, W. Va. Northeastern Forest Experiment Station.
W. S. Platts, and W. F. Megahan.
In: Transactions, 40th North American Wildlife and Natural Resources Conference, 1975. Wildlife Manage. Inst., Washington, D.C., p. 229-239. (1975).

Descriptors: *Anadromous fish, Aquatic environment, *Stream erosion, Particle size, *Fish spawning, *Salmon, Rainbow trout, Logging, Erosion, Idaho, Sedimentation, Scour, Road construction, Aggradation, Degradation, Riverbed, Demonstration watersheds, *River beds.
Identifiers: *South Fork Salmon River(Idaho), Granitic soils, *Idaho Batholith time trend.

The South Fork Salmon River is an important chinook salmon and steelhead trout fishery in the mountains of central Idaho. Because of increased logging, road construction, and severe floods after 1950, excessive sediment, especially fines, was deposited in the river channel, seriously damaging the major spawning areas by 1966. A study was designed to evaluate trends in the size of riverbed surface materials in four major spawning areas in the upper half of the river. The size composition of materials favorable for spawning improved greatly from 1966 to 1974; a large decrease in fines was accompanied by a large increase in gravels and a lesser increase in rubble. The change in spawning materials resulted from a reversal of the previous high rate of sediment flow into the channel system compared to sediment flow out of the system. The reductions in watershed erosion and sediment entry into the river resulted from: (1) a moratorium on logging and road construction activities on the watershed; (2) natural watershed stabilization processes; and (3) a watershed rehabilitation program. This study demonstrates that sediment damage to a valuable fishery resource is not irrevocable and illustrates the need to program future logging and road construction over both time and space to avoid degradation of salmonid spawning areas. (Forest Service)
W76-07018

SEDIMENT STORAGE IN CHANNELS DRAINING SMALL FORESTED WATERSHEDS IN THE MOUNTAINS OF CENTRAL IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-07019

SEDIMENTATION IN RELATION TO LOGGING ACTIVITIES IN THE MOUNTAINS OF CENTRAL IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-07020

EROSIONAL EFFECTS OF WILDFIRE AND LOGGING IN IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-07027

A SOLVABLE MODEL OF 'SHEAR DISPERSION',
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
W. C. Thacker.
Journal of Physical Oceanography, Vol. 6, No. 1, p 66-75, January 1976. 9 fig, 10 ref.

Descriptors: *Dispersion, *Silts, *Model studies, Mathematical models, *Mixing, *Diffusion, Path of pollutants, Water pollution, Silting, Water circulation.

Shear dispersion results from vertical shear of horizontal velocity and vertical mixing, features which cannot be included explicitly in one-layer, vertically integrated models. The parametric description of shear dispersion as effective horizontal diffusion in one-layer models was investigated by comparing analytic solutions of two-layer dispersion equations to the corresponding solutions of a one-layer diffusion equation. The diffusion description was found to be poor for times comparable with or shorter than the vertical mixing time but excellent for longer times. (Sims - ISWS)
W76-07067

INDEX OF SURFACE WATER STATIONS IN TEXAS, JANUARY 1976.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-07127

DESCRIPTION OF A NEW TYPE OF CORER FOR VERY FLUID SEDIMENTS, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Hydrobiology.
N. Giani.
Ann Limnol. 10(1), p99-108, 1974.

Descriptors: Sediments, Sampling, Distribution, Lakes, *Lake sediments.
Identifiers: Corer(Sediments), Mountain lakes.

This new corer was designed particularly for fluid sediments. It consists of a tube, 8 cm in diameter which closes at both ends. Its performance is superior to that of an Ekman grab under the same conditions. The reasons for this difference are analyzed. It is also possible to study the vertical distribution of the fauna with this corer. Some preliminary results from a high mountain lake are given.--Copyright 1975, Biological Abstracts, Inc.
W76-07282

2K. Chemical Processes

THE PRECIPITATION CHEMISTRY OF WESTERN NEW YORK STATE: A METEOROLOGICAL INTERPRETATION,
Cornell Univ., Ithaca, N. Y.
A. C. Dittenhoefer, and B. E. Dethier.
Cornell University Water Resources and Marine Sciences Center, Ithaca, N.Y. April 1976. 45 p, 7 fig, 11 tab, 49 ref. OWRT A-044-NY(1) 14-31-0001-3532.

Descriptors: Air circulation, Air masses, Air pollution, *Chemistry of precipitation, *Precipitation(Atmospheric), Weather patterns, *New York, Meteorology, *Rain water, Sulfates, *Rainfall.

Precipitation chemistry data for western New York were studied and through the use of 12- and 24-hour isentropic trajectories, the distant source regions and paths of long-range transport were determined. Meteorological variables such as surface wind speed and direction, height of the mixed layer, mean relative humidity below cloud base, and the past histroy of precipitation were monitored to assess their importance in controlling rainwater concentrations. Ionic constituents such as sulfate owe much of their presence in rainwater to wet removal from the rain-producing layers (1-5 km), where their concentration is largely influenced by long-range transport. Local sources affecting the precipitation chemistry of the region are wide-spread and contribute little to the variance of chemical concentration. Constituents derived from the soil, such as potassium, calcium, ammonium, and magnesium, seem to be directly related to trajectory wind speed and atmospheric instability. Results from a precipitation sampling network in western New York indicate that air mass precipitation is characterized by markedly higher ionic content compared to frontal rainfall, and that rainfall pH is significantly lower in air mass precipitation.
W76-06815

SR90 IN THE WATER-ATMOSPHERE INTERFACE,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5B.
W76-06888

USE OF PERTURBED GAMMA-GAMMA DIRECTIONAL CORRELATIONS IN THE STUDY OF ANOMALOUS WATER STRUCTURE,
North Dakota State Univ., Fargo. Dept. of Physics.
For primary bibliographic entry see Field 1B.
W76-06906

RELATIONSHIP OF GEOMORPHOLOGY TO ORIGIN AND DISTRIBUTION OF A HIGH CHARGE VERMICULITIC SOIL CLAY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-06926

THE APPLICATION OF SPARK SOURCE MASS SPECTROMETRY TO THE ANALYSIS OF WATER SAMPLES,
Accu-Labs Research, Inc., Wheatridge, Colo.
For primary bibliographic entry see Field 5A.
W76-06945

THE RELATION BETWEEN WATER CHEMISTRY AND MINERAL ZONATION IN THE CENTRAL CITY MINING DISTRICT, COLORADO,
Colorado School of Mines, Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
For primary bibliographic entry see Field 5B.
W76-06955

AN INTRODUCTION TO HYDROGEOCHEMICAL EXPLORATION,
For primary bibliographic entry see Field 4B.
W76 06956

STREAMFLOW CHEMISTRY AND NUTRIENT YIELDS FROM UPLAND PEATLAND WATERSHEDS IN MINNESOTA,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
E. S. Verry.
Ecology Vol 56, No 5, p 1149-1157, Late Summer, 1975. 4 fig, 7 tab, 39 ref.

Descriptors: *Streamflow, Chemistry, *Water quality, *Peatlands, Bogs, Fens, Watersheds(Basins), *Minnesota, *Nutrients, *Water chemistry, *Pollutant identification.

Twenty-two water quality parameters were determined for the streamflow from complex but typical upland-peatland watersheds over a period of 5 yr. Five watersheds with oligotrophic peatlands and one with a minerotrophic peatland were studied. Concentrations of organically derived nutrients are highest in the streamflow from watersheds containing oligotrophic peatlands; while concentrations of nutrients derived from solution of aquifer minerals are higher in streamflow from the watershed containing a minerotrophic peatland. However, flow-weighted concentrations of organically derived nutrients are similar for both watersheds. Annual nutrient yields (kilogram/hectare per year) calculated for two of the tight upland-oligotrophic peatland watersheds are generally low and are quite similar to values for other forested areas in North America which do not contain peatlands. (Forest Service)
W76-07022

HYDROCHEMICAL REGIME AND CHEMICAL COMPOSITION OF OLIGOTROPHIC BOG WATERS,
For primary bibliographic entry see Field 5B.
W76-07079

SPATIAL VARIABILITY OF THE LEACHING CHARACTERISTICS OF A FIELD SOIL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 2G.
W76-07089

APPLICATION OF GEOCHEMICAL PRINCIPLES, ISOTOPIC METHODOLOGY, AND ARTIFICIAL TRACERS TO KARST HYDROLOGY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-07112

AVAILABILITY OF GROUND WATER IN THE UPPER CONNECTICUT RIVER BASIN, NORTHERN NEW HAMPSHIRE,
Geological Survey Concord, N. H.
For primary bibliographic entry see Field 7C.
W76-07114

WATER RESOURCES OF THE LAKE OF THE WOODS WATERSHED, NORTH-CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-07115

NUTRIENT CONCENTRATIONS OF SURFACE WATERS IN SOUTHERN FLORIDA, SEPTEMBER 1970 TO APRIL 1975,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5A.
W76-07126

PREDICTING IONIC DISTRIBUTIONS IN LARGE SOIL COLUMNS,
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 2G.
W76-07234

INVESTIGATIONS ON THE CO2 BALANCE OF SUBMERGED HIGHER WATER PLANTS IN RUNNING WATER BY MEANS OF A MOBILE LABORATORY FOR INFRARED GAS ANALYSIS, (IN GERMAN),
Technische Universitaet, Dresden (East Germany). Bereich Hydrobiologie.
For primary bibliographic entry see Field 2I.
W76-07312

THE USE OF ION EXCHANGE METHODS FOR THE DETERMINATION OF TRACE ELEMENTS IN NATURAL WATERS-I: COBALT, (IN GERMAN),
Vienna Univ. (Austria). Analytisches Institut.
J. Korkisch, and D. Dimitriadis.
Talanta. 20(12), p 1287-1293, 1973.

Descriptors: *Cobalt, Pollutant identification, *Ion exchange, *Analytical techniques, Anions, Trace elements, Methodology, *Water analysis, Metals.

Two methods are described for the determination of Co in natural waters. In the 1st, the sample is acidified with HC1, then ascorbic acid and potassium thiocyanate are added and the solution is run through a column of strongly basic anion-exchanger (Dowex 1-X8). The Co thiocyanate complex is retained on the column while other ions are washed through with a mixture of organic solvent, aqueous HC1. The Co is then eluted with purely aqueous 6M HC1 and determined photometrically with nitros-R salt. In the 2nd method, (for very dirty samples) the filtered sample is taken through a multi-step evaporation procedure and then added to the column in the mixed solvent. Result are presented for many samples collected in Lower Austria. (See also W76-07409 and W76-07410)--Copyright 1975, Biological Abstracts, Inc.
W76-07408

THE USE OF ION EXCHANGE METHODS FOR THE DETERMINATION OF TRACE ELEMENTS IN NATURAL WATERS-II: CADMIUM, (IN GERMAN),
Vienna Univ. (Austria). Analytisches Institut.
J. Korkisch, and D. Dimitriadis.
Talanta. 20(12), p 1295-1301, 1973.

Descriptors: *Cadmium, Metals, *Ion exchange, *Pollutant identification, Analytical techniques, *Water analysis, Anions, Trace elements, Methodology, Spectrophotometry.

A method is described for the isolation of ppm levels of Cd from natural waters and their spectrophotometric determination. The water samples (1.1) is made 1.2M in HC1 or 1.0M in HBr, filtered and passed through a column of Dowex 1-X8 (chloride form) anion-exchanger. The Cd is quantitatively sorbed and simultaneously separated from other trace metals in the sample. Co-adsorbed Zn is removed with 0.15M HBr, and the Cd eluted with 2M HNO3 and determined by the dithizone method. Many Austrian water samples have been analyzed and found to contain 0.1-4.0 ppm of Cd. (See also W76-07408 and W76-07410)--Copyright 1975, Biological Abstracts, Inc.
W76-07409

APPLICATION OF ION EXCHANGE METHODS FOR THE DETERMINATION OF TRACE ELEMENTS IN NATURAL WATERS-III: THORIUM, (IN GERMAN),
Vienna Univ. (Austria). Analytisches Institut.
J. Korkishc, and D. Dimitriadis.
Talanta. 29(12), p 1303-1308, 1973.

Descriptors: Trace elements, *Pollutant identification, Methodology, *Water analysis, Analytical techniques, Anions, Spectrophotometry.
Identifiers: *Thorium.

A method is described for separation of ppb levels of Th from natural waters and a spectrophotometric finish. A 1-1 water sample is acidified with nitric acid and filtered, then evaporated, and the Th absorbed on Dowex 1-X8 strongly basic anion-exchanger (nitrate form) from 8M nitric acid to separate it from accompanying elements. The Th is eluted with 6M hydroc holoric acid and determined spectrophotometrically by the Arsenazo III method. The method was applied to determination of Th at the 0.4-4.5 ppb level in Austrian natural waters. (See also W76-07408 and W76-07409)--Copyright 1975, Biological Abstracts, Inc.
W76-07410

THE DIRECT TITRATION OF WATER-SOLUBLE SULFIDE IN ESTUARINE MUDS OF MONTSWEAG BAY, MAINE,
Maine Univ., Walpole. Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W76-07415

2L. Estuaries

THE SUBMERSED MACROPHYTES OF THE PAMLICO RIVER ESTUARY, NORTH CAROLINA,
East Carolina Univ., Greenville, N. C. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-06809

NEPA AND THE CZMA: THE ENVIRONMENTAL IMPACT STATEMENT AND SECTION 306 GUIDELINES,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 6G.
W76-06817

DATA MANAGEMENT IN COASTAL ZONE PLANNING,
Dames and Moore, Los Angeles, Calif. Planning Systems Group.
For primary bibliographic entry see Field 7C.
W76-06818

SITING OF ENERGY FACILITIES IN THE COASTAL ZONE -- A CRITICAL REGULATORY HIATUS,
Marshall-Wythe School of Law, Williamsburg, Va.
For primary bibliographic entry see Field 6G.
W76-06819

ARTIFICIAL RADIOACTIVITY OF SEA WATER AND FOOD HYDROBIONTS OF THE WORLD OCEAN,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliningrad (USSR).
For primary bibliographic entry see Field 5B.
W76-06887

SR90 AND CS137 IN SURFACE WATERS OF THE BALTIC, NORTH, IRISH, AND NORWAY SEAS,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliningrad (USSR).
For primary bibliographic entry see Field 5B.
W76-06889

CS137 AND SR90 IN THE SEA OF AZOV,
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5B.
W76-06890

ACCUMULATION OF CS137 BY INDUSTRIAL FISH SPECIES IN THE CASPLAN SEA,
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
For primary bibliographic entry see Field 5C.
W76-06891

MECHANISMS OF ACCUMULATION OF RADIOACTIVE AND STABLE SR BY NORTHERN MARINE ALGAE UNDER NATURAL AND EXPERIMENTAL CONDITIONS,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliingrad (USSR).
For primary bibliographic entry see Field 5C.
W76-06892

RADIOACTIVE CONTAMINATION OF COMMERCIAL HYDROBIONTS OF THE WESTERN BASIN,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kainingrad (USSR).
For primary bibliographic entry see Field 5C.
W76-06894

ACCUMULATION OF SR90, CA, AND SR BY FISH IN SEAS AND OCEANS,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06896

ACCUMULATION OF RADIOACTIVE AND STABLE ZINC BY BLACK SEA ALGAE CYSTOSEIRA BARBATA AND ULVA RIGIDA,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06897

ON TH234 ACCUMULATION BY MARINE ORGANISMS,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06898

MATHEMATICAL MODEL OF SR90 EXCHANGE BETWEEN CYSTOSEIRA AND MARINE WATER,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06899

RADIOECOLOGO-BIOCHEMICAL APPROACH TO THE STUDY OF THE COBALAMINE CYCLE IN THE OCEAN,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06900

THE ROLE OF SOME POLYSACCHARIDES OF BROWN ALGAE IN THE EXTRACTION OF SR90 FROM SEA WATER,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06901

INFLUENCE OF SALINITY AND CONCENTRATION OF SR AND CA IN WATER ON THE SR90 ACCUMULATION BY CYSTOSEIRA,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06903

A METHODOLOGY FOR IMPACT ASSESSMENT IN THE ESTUARINE/MARINE ENVIRONMENT,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6G.
W76-06910

SURVEY OF CURRENT ENVIRONMENTAL RESEARCH ON SAN FRANCISCO BAY AND DELTA WATERS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6G.
W76-06911

SAN FRACISCO BAY AND DELTA SYSTEM: A SELECTED BIBLIOGRAPHY,
California Univ., Livermore. Lawrence Livermore Lab.
M. F. Buchanan, and R. L. Ritschard.
Available from the National Technical Information Service, Springfield, Va. 22161 as UCRL-51943 $12.50 in paper copy, $2.25 in microfiche. Report UCRL-51943, October 1975. 486 p. W-7405-Eng-48.

Descriptors: *Bibliographies, *Geographical regions, Environmental effects, Wastes, Legal aspects, *California, Bays, Deltas, Water pollution control.
Identifiers: San Francisco Bay and Delta(Calif), Sacramento-San Joaquin River and Delta System(Calif).

This bibliography contains over 2500 references which are divided into seven major categories: environmetal studies, physical studies, aquatic studies, effects, waste management, water and related resources, and legal studies. Two geographical designations are a part of each major category;-the Sacramento-San Joaquin River and Delta System, and the San Francisco and San Francisco Bay area. Brief abstracts are included with some references. (Chilton-ORNL)
W76-06912

SELECTED BIBLIOGRAPHY OF TERRESTRIAL, FRESHWATER, AND MARINE RADIATION ECOLOGY,
Washington State Univ., Pullman. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-06913

COVARIANCE FUNCTIONS AND SPECTRA OF A RANDOM WAVE FIELD,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
C. C. Tung, and K. Pajouhi.
Journal of Physical Oceanography, Vol. 6, No. 1, p 104-107, January 1976. 11 ref.

Descriptors: *Oceanography, *Gravity waves, *Velocity, *Statistical methods, Free surfaces, Probability, Fluid mechanics, Stochastic processes, Analytical techniques.
Identifiers: *Covariance functions, Spectra, Random wave field.

Statistical properties of random wave field associated with both surface waves and internal waves have been investigated to understand wave dynamics and to interpret field measurements. covariance functions and spectra of components of fluid particle velocity are obtained, taking into consideration the effect of free surface fluctuations, for a Gaussian, stationary and homogeneous random gravity wave field in deep water, using infinitesimal wave solutions. Approximate representations of the covariance functions and spectra differ from those when the effects of free surface fluctuations are ignored, especially at, around and above the equilibrium surface. The covariance function is only one-fourth of that when the free surface fluctuations are ignored. (Singh-ISWS)
W76-06931

SOME ASPECTS OF THE FORCED RESPONSE OF STRATIFIED COASTAL REGIONS,
Oregon State Univ., Corvallis. School of Oceanography.
J. S. Allen.
Journal of Physical Oceanography, Vol. 6, No. 1, p 113-119, January 1976. 2 fig, 1 tab, 9 ref.

Descriptors: *Oceanography, *Seashores, *Continental shelf, *Ocean waves, *Wind tides, Model studies, Upwelling, Internal waves, Coastal engineering.
Identifiers: *Meterologic forcing, Baroclinic component, Barotropic component, Wind stress.

A two-layer model with an idealized continental shelf and bottom slope topography is utilized to study some properties of the response of stratified coastal regions to meteorological forcing by an alongshore wind stress composed of uncoupled baroclinic and barotropic components. The coastline is assumed straight with no alongshore variations in the bottom topography. The baroclinic component consists of forced internal Kelvin waves and the barotropic component consists of forced continental shelf waves. The alongshore and time-dependent behavior of the baroclinic and barotropic components is governed by forced, first-order wave equations. The response to an impulsively applied, upwelling-favorable wind stress with a specialized alongshore structure is studied to give insight into the qualitative nature of the

behavior of the forced time-dependent, baroclinic and barotropic components. The solution shows how the region of forced upward motion of density surfaces may propagate alongshore to locations distant from that of the wind stress which causes the upwelling. (Singh-ISWS)
W76-06932

THE IDEFJORD: A DESTROYED MARINE ENVIRONMENT, (IN SWEDISH),
For primary bibliographic entry see Field 5B.
W76-06988

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME III, THE INTERIM PROGRAM,
RAND Corp., Santa Monica, Calif.
J. J. Leendertse, S. K. Liu, and A. B. Nelson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-252 272, $4.00 in paper copy, $2.25 in microfiche. Report R-1884-OWRT, October 1975, 23 p. $1.50 OWRT C-5252 (no. 4237)(3).

Descriptors: Computer programs, Coasts, Seas, Flow, *Estuaries, *Mathematical models, *Numerical methods, Tides, Fluid dynamics, Computer models, Coastal engineering, Simulation analysis, Unsteady flow, Model studies, Finite element analysis.
Identifiers: Coastal seas.

A computer program of a three-dimensional model for estuaries and coastal seas, as it stands at the end of the second phase of a three-phase program, is presented. The program can perform numerical integration of the equations of motion, the equation of continuity, and the equations representing transport of salt and temperature. A complicated equation of state is used. Vertical mass and momentum transfer coefficients are computed from density and velocity information. The program is experimental. The aspects of computation are described in R-1764-OWRT, A Three-Dimensional Model for Estuaries and Coastal Seas: Volume II, Aspects of Computation, by Jan J. Leendertse and Shiao-Kung Liu. (See W75-10900).
W76-07016

MEASUREMENT OF SEA SURFACE TEMPERATURE BY THE NOAA 2 SATELLITE,
Environmental Research and Technology, Inc., Concord, Mass.
J. L. Cogan, and J. H. Willand.
Journal of Applied Meteorology, Vol. 15, No. 2, p 173-180, February 1976. 4 fig, 3 tab, 20 ref. Navy N66314-73-C-1749

Descriptors: *Remote sensing, *Water temperature, *Oceans, Satellites(Artificial), Data processing, Analytical techniques, Radiation, Infrared radiation, Clouds, Absorption, Moisture, Instrumentation, Oceanography.
Identifiers: *NOAA-2, Radiometers.

Sea surface temperature (T sub s) may be inferred to a useful accuracy from satellite measurements of infrared radiances in the atmospheric windows. However, even in the absence of clouds, the slight opacity produced by water vapor continuum, carbon dioxide, ozone and aerosol absorption causes the temperature 'seen' by the satellite to be lower than that measured by ships or aircraft. The difference between (T sub s) and the temperature inferred from infrared radiances when looking vertically through a cloud-free atmosphere was estimated to about plus or minus 0.5 K for the 10.5-12.5 micrometer window of the scanning radiometer of NOAA 2 when data on certain atmospheric variables are available. A simple parametric formula in terms of integrated water vapor content gave about that accuracy while saving considerable computation time. It was found that T sub s may be estimated to an accuracy of about plus or minus 1 K within about 500 km of the subsatellite track in the Mid-Ocean Dynamics Experiment area in a comparison of satellite data with ship and aircraft measurements, despite various sources of possible error. An area represented by each mapped T sub s of about 40 kmx40 km could be attained for areas that were nearly cloud-free. (Sims - ISWS)
W76-07072

SUSPENDED-SEDIMENT SAMPLING TOWERS AS USED ON THE INTERTIDAL FLATS OF THE WASH, EASTERN ENGLAND,
Imperial Coll. of Science and Technology, London (England).
M. B. Collins.
Estuarine and Coastal Marine Science, Vol. 4, No. 1, p45-57, January 1976. 8 fig, 15 ref.

Descriptors: *Suspended solids, *Sampling, *Intertidal areas, Equipment, On-site data collections, On-site investigations, Sediments, Tides, Tidal waters, Estuaries, Coasts, Tidal marshes, Beaches.
Identifiers: *England(The Wash), *North Sea.

The design, construction and field application of systems for collecting samples of suspended material in tidal waters over an intertidal zone were described. Each sampler consisted of: a tower framework, sample containers for the water-sediment mixture, and a series of mechanical or electromechanical release mechanisms to control the instant of sampling (in relation to the tidal cycle). The suspended-sediment sampling systems were used over 40 tidal cycles across an intertidal flat in the Wash. The systems demonstrated that an extensive sampling program can be undertaken at low cost and using minimum manpower in the field. Mechanisms and sampling techniques described were considered to have broader applications in estuarine and oceanographic investigations. (Sims - ISWS)
W76-07087

SEDIMENTATION RATES AND MEAN RESIDENCE TIMES OF STABLE PB AND 210PB IN LAKE WASHINGTON, PUGET SOUND ESTUARIES AND A COASTAL REGION,
Washington Univ., Seattle. Coll. of Fisheries; and Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 5B.
W76-07093

PHOSPHATE, SILICATE, NITRATE, AND AMMONIA IN LINDASPOLLENE, A NORWEGIAN LAND-LOCKED FJORD,
Bergen Univ. (Norway). Biological Station.
For primary bibliographic entry see Field 5B.
W76-07098

FIELD STUDIES ON OZONE INACTIVATION OF A GYMNODINIUM BREVE TOXIN,
National Marine Fisheries Service, Milford, Conn. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5G.
W76-07099

EFFECT OF ANAEROBIC CONDITIONS IN BOTTOM WATERS ON THE OCCURRENCE OF RED TIDES AT OMURA BAY,
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W76-07101

ZOOPLANKTON DIVERSITY IN FOUR NORWEGIAN FJORDS,
Trondheim Univ. (Norway). Biological Station.
For primary bibliographic entry see Field 5C.
W76-07102

PROCESSES CONTROLLING THE DISSOLVED SILICA DISTRIBUTION IN SAN FRANCISCO BAY,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5C.
W76-07107

URBAN WATER MANAGEMENT AND COASTAL WETLAND PROTECTION IN COLLIER COUNTY, FLORIDA,
Black, Crow and Eidsness, Inc. Gainesville, Fla.
For primary bibliographic entry see Field 3D.
W76-07150

DIFFUSION AND MIGRATION OF POLLUTED WATER ALONG THE BELGIAN BEACHES. NEW EXPERIMENT INVOLVING DUMPING OF 100 KG RHODAMINE B: PRELIMINARY CONCLUSIONS, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Ostend. Laboratoire de Bacteriologie.
For primary bibliographic entry see Field 5B.
W76-07207

DYNAMIC BEHAVIOR OF BOX-GIRDER JETTIES,
Queen Mary Coll., London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8A.
W76-07208

STATISTICAL DESIGN BASIS FOR SUBMERGED DIFFUSER,
Quirk, Lawler and Matusky, New York.
For primary bibliographic entry see Field 5B.
W76-07214

DURABILITY OF CONCRETE IN SEAWATER,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8F.
W76-07218

PREDICTION OF WIND WAVE HEIGHTS,
Ecole Polytechnique Federale de Lausanne (Switzerland). Laboratoire d'hydraulique.
For primary bibliographic entry see Field 8B.
W76-07229

WOVEN PLASTIC CLOTH FILTERS FOR STONE SEAWALLS,
Moffatt and Nichols, Long Beach, Calif. Coastal Engineering Dept.
For primary bibliographic entry see Field 8C.
W76-07230

SIMULATION OF PIERS IN HYDRAULIC MODELS,
Manchester Univ. (England). Department of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-07231

SALT-TOLERANT SILT GRASS (PASPALUM VAGINATUM SW.),
Miami Univ., Coral Gables, Fla.
For primary bibliographic entry see Field 3C.
W76-07252

MESOPHILIC CLOSTRIDIA IN PUGET SOUND,
Washington Univ., Seattle. Inst. for Food Science and Technology.
For primary bibliographic entry see Field 5C.
W76-07255

PRODUCTIVITY OF HIGHER HYDROPHYTES AND STOCK OF PHYTOPHILIC INVERTEBRATES IN THE KILIA DELTA OF THE DANUBE, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
V. M. Klokov, and L. N. Zimbalevskaya.
Gidrobiol Zh. 10(1), p 74-77, 1974.

Descriptors: *Productivity, Invertebrates, Deltas, Distribution, Biomass, Benthos, Aquatic plants, Reeds.
Identifiers: *Danube River delta, *Hydrophytes, *Phytophilic invertebrates, Potamogeton-Pectinatus, Sparganium-Polyedrum, Trapa-Natans, Water chestnut, Pondweeds.

Data are presented on the distribution of higher hydrophytes in the Kilia Delta of the Danube, on the stock of higher hydrophytes in the Delta and on the biomass and stock of phytophilic invertebrates and benthos in the freshwater and brackish water zones of the delta. The aquatic vegetation of the Kilia Delta is diverse and is represented by plant associations belonging to 16 formations. The bur-reed Sparganium polyedrum associations occupy the greatest area among the groups of amphibious plants, the water chestnut Trapa natans among plants with floating leaves and the fennel pondweed Potamogeton pectinatus among the submerged plants.--Copyright 1975, Biological Abstracts, Inc.
W76-07277

SEVERAL ASPECTS OF BACTERIOLOGIC POLLUTION IN MOLLUSK-PRODUCING WATERS OF ALGARVE, (IN FRENCH),
Instituto de Biologia Maritima, Lisbon (Portugal).
For primary bibliographic entry see Field 5C.
W76-07293

ACTIVITY OF OIL OXIDIZING BACTERIA ISOLATED FROM THE WATER OF LAGOON OF KURSKI ZALIV AND THE BALTIC SEA COAST, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
For primary bibliographic entry see Field 5C.
W76-07294

FIRST RESULTS ON ARTIFICIAL REPRODUCTION OF BASS, MORONE LABRAX (L.), REARED IN BRACKISH WATER, (IN ITALIAN),
Ist. Zool., Univ. Parma, Parma, Italy. Parma Univ. (Itlay). Instituto di Zoologia.
G. Alessio, P. Bronzi, G. Gandolfi, and B. Schreiber.
Ist Lombardo Accad Sci Lett Rend Sci Biol Med B. 107(1), p93-106, 1973.

Descriptors: *Reproduction, Bass, Brackish water, Carp, Salinity, Fertility, Fish eggs.
Identifiers: Morone-Labrax.

Fertilizable eggs were obtained from 6 females, 1 of which treated with carp hypophysis, 2 hand-stripped after being kept in salt water for a brief period and the remaining 3 hand-stripped immediately after their capture in brackish water at low salinity. For the fertilization, sperm obtained from non-treated males was used. Although the percentage of fertility and hatching was generally low and the mortality high in the 1st days of post-larval development, a certain number of fry survived at present, after over 1 mo. from their hatching.--Copyright 1975, Biological Abstracts, Inc.
W76-07298

A STUDY OF THE ZOOPLANKTON FROM THE DANUBE MOUTH AND FROM THE PRE-DELTA AREA DURING 1970 (IN GERMAN),
Academia R. S. R., Bucharest (Rumania). Institutul de Biologie.
For primary bibliographic entry see Field 5C.
W76-07301

THE EFFECT OF SOME METALS ON PRIMARY PRODUCTION IN THE COASTAL WATER OF THE CASPIAN SEA, (IN RUSSIAN),
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
For primary bibliographic entry see Field 5C.
W76-07313

THE EFFECTS OF THREE ANTI-PETROLEUM AGENTS ON THE PRIMARY PRODUCTIVITY OF AN EXPERIMENTAL COMMUNITY OF BENTHIC DIATOMS, (IN FRENCH),
Museum National d'Histoire Naturelle, Paris (France). Laboratoire de Physiologie Generale et Comparee; and Institut Oceanographie.
For primary bibliographic entry see Field 5C.
W76-07317

MARINE SOIL MECHANICS,
Norwegian Geotechnical Inst., Oslo.
For primary bibliographic entry see Field 8D.
W76-07321

ACHIEVING FEDERAL-STATE COORDINATION IN COASTAL RESOURCES MANAGEMENT,
Louisiana State Univ., Baton Rouge. Sea Grant Legal Program.
For primary bibliographic entry see Field 6E.
W76-07359

THE CONCEPT OF STATE AND LOCAL RELATIONS UNDER THE CZMA,
National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-07360

CANADIAN APPROACH TO THE THIRD LAW OF THE SEA CONFERENCE,
New Brunswick Univ., Fredericton. Law School.
For primary bibliographic entry see Field 6E.
W76-07364

REPORT OF THE OCEAN POLICY RESEARCH WORKSHOP,
Rhode Island Univ., Kingston. Law of the Sea Inst.
For primary bibliographic entry see Field 6E.
W76-07367

CONTEMPORARY LAW OF THE SEA: TRANSPORTATION, COMMUNICATION AND FLIGHT,
Rhode Island Univ., Kingston. Law of the Sea Inst.
For primary bibliographic entry see Field 6E.
W76-07368

INVESTIGATION OF TRONDHEIM FJORD: ORIENTATION TO PLANNING AND PRELIMINARY RESULTS, (IN NORWEGIAN),
Norges Tekniske Vitsenskapsakademi, Trondheim.
For primary bibliographic entry see Field 5A.
W76-07405

DECOMPOSITION OF PARTICULATE ORGANIC MATERIALS IN TOKYO BAY AT SUMMER STAGNATION PERIOD IN 1972,
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W76-07406

BASIC FEATURES OF THE CHEMICAL COMPOSITION OF ORGANIC MATTER IN SEDIMENTS OF MARINE AND OCEANIC BASINS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5A.
W76-07407

ECOLOGY OF THE OGUN RIVER ESTUARY, NIGERIA,
Ibadan Univ. (Nigeria). Dept. of Geology.
L. O. Asseez, E. A. Fayose, and M. E. Omatsola.
Palaeogeogr Palaeoclimatol Palaeoecol. 16(3), p 243-260, 1974.

Descriptors: Ecology, Estuaries, *Estuarine environment, *Distribution patterns, *Path of pollutants, Sediments, *Benthos, Africa.
Identifiers: Ammoastuta-salsa, Ammobaculites-crassus, Ammobaculites-dilatatus, Ammobaculites-exiguus, Ammonia-beccarii, *Foraminifera, Haplophragmoides-manilaensis, Haplophragmoides-wilberti, Miliammina-earlandi, Miliammina-fusca, *Nigeria(Ogun River Estuary), Trochammina-macrescens.

The distribution of benthonic communities (particularly Foraminifera) were studied from 14 samples obtained from the Ogun River estuary and environs. Ten species of benthonic Foraminifera were identified (Ammoastuta salsa, Ammobaculites crassus, A. dilatatus, A. exiguus, Ammonia beccarii, Haplophragmoides manilaensis, H. wilberti, Miliammina earlandi, M. fusca and Trochammina macrescens); 2 of these constitute over 90% of the total foraminiferal population. Two broad biofacies are recognizable, namely the upper estuarine facies of Ammobaculites and the lower estuarine facies comprising arenaceous and calcareous forms with a preponderance of Ammonia beccarii (L.). Large populations of few species occur in the lower estuary, an area of weakly saline water with marked salinity fluctuations. The upper estuary on the other hand is sparsely populated and contains tests mainly of arenaeous Foraminifera. A few species are distinctive of particular facies but some are distributed throughout the estuary. Substrate is not a causal ecological factor, because sediments are similar in physical attributes throughout the estuary. Salinity and rate of sedimentation are among the more important factors affecting the distribution of all species. The low-energy nature of the environment is established by the abundance of fecal pellets and the fragility of the tests of the arenaceous Foraminifera.--Copyright 1975, Biological Abstracts, Inc.
W76-07411

THE DIRECT TITRATION OF WATER-SOLUBLE SULFIDE IN ESTUARINE MUDS OF MONTSWEAG BAY, MAINE,
Maine Univ., Walpole. Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W76-07415

EXOTIC FISHES IN FRESH AND BRACKISH WATERS OF FLORIDA,
Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2I.
W76-07421

MEANS FOR SHOWING AND/OR DETOURING WATER CURRENTS AND THE PREPARATION THEREOF,
Rhone-Poulenc S.A., Paris (France). (Assignee).
For primary bibliographic entry see Field 8A.
W76-07432

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DESALINATION MATERIALS MANUAL,
Dow Chemical Co., Freeport, Tex.
P. F. George, J. A. Manning, Jr., and C. F. Schrieber.
OWRT/S--76/34 May 1975, 328 p, 104 fig, 56 tab, 51 ref.

Descriptors: *Desalination plants, *Corrosion control, *Water costs, Waste water treatment, Materials engineering, Desalination apparatus, Pre-treatment(Water), Metals, Materials, Alloys, Copper alloys, Aluminum alloys, Iron alloys, Stainless steel, Distillation.

Materials-related water costs could be reduced by a factor of 20% to 30% if knowledge is properly applied to the next generation of acid pretreated-distillation type desalination plants. Factors recognized as contributing to this reduction include recognition of: the critical importance of oxygen removal and pH control in the pretreatment process and the feasibility of satisfactorily controlling proper oxygen and pH levels through informed use of modern instrumentation. Higher priced, more corrosion resistant materials should be employed where conditions of remote geographical location or limited plant size make the use of sophisticated instrumentation impractical. Relatively low cost aluminum alloys may have applicability for heat transfer surfaces under proper design, water chemistry, and operational conditions. Modern instantaneous corrosion rate measuring instrumentation to monitor process operations for upsets creating corrosive conditions and taking corrective action when such corrosive conditions are found. Corrosion inhibitors can materially extend the life of metals and alloys in the desalination plant. Less than 1 ppm of iron reduces the corrosion rate of common copper alloys by 50% while pretreatment of aluminum alloys by boiling in deionized water can minimize pitting attack on aluminum exchanger tubing. Low level chromate-phosphate inhibitors, <0.1 ppm chromate, can substantially reduce both general and localized corrosion on steel, low alloy steel, copper alloys, and stainless steels.
W76-06801

ANALYSIS AND OPTIMIZATION OF A MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION SYSTEM,
Kansas State Univ., Manhattan.
L. T. Fan.
OSW R and D Progress Report No. 355, May 1968. 14 p, 3 fig, 2 tab, 14 ref.

Descriptors: *Mathematical models, Desalination, Distillation, Flash distillation, Design, Heat balance.
Identifiers: *Multiple effect distillation, Distillation processes, Material balance.

A mathematical model of a multi-effect multi-stage flash distillation system that can be used in process optimization studies is developed. The model enables the heat input to the brine heater, the recycle flow rate in each effect, the concentration and temperature of the flashing brine leaving each effect, and the number of stages in each effect to be treated as variables in an optimization study. The model is believed to be accurate enough to describe the process, yet simple enough to be used in the simulation, design, and optimization of the process. (See also W70-04682) (OWRT)
W76-06802

EVALUATION OF WASTEWATER TREATMENT PLANTS AT HENDERSON, NEVADA,
Environmental Protection Agency, San Francisco, Calif.
For primary bibliographic entry see Field 5D.
W76-07055

REVERSE OSMOSIS OF TREATED AND UNTREATED SECONDARY SEWAGE EFFLUENT; APPENDIX A-2 AND APPENDIX A-6,
Eastern Municipal Water District, Hemet, Calif.
For primary bibliographic entry see Field 5D.
W76-07061

OPERATION OF THE 3-STAGE FLASH DEVICES PLANT, 1969-1972,
Envirogenics Co., El Monte, Calif.
R. N. Webb, G. G. Weth, G. O. White, and R. K. Huber.
Available from the National Technical Information Services, Springfield, Va., 22161, as PB-252 273, $6.75 in paper copy, $2.25 in microfiche. OWRT/S--76/26, April 1972. 154 p, 17 fig, 9 ref. DoI 14-01-0001-2240.

Descriptors: *Flash distillation, Brines, Fluid flow, Instrumentation, Temperature, Measurement, *Desalination plants, *Distillation, Operations.

Operation of the 3-Stage Flash Devices Plant from July 1969 through January 1972 is discussed. Results are included for testing to determine non-equilibrium in 15 foot and 7 foot long stage with no flash device. Results are included for hydraulic simulation of a VTE-MSF junction. Modifications of the plant are discussed which led to the Matrix Series of Tests (a large network of tests designed to systematically determine a relationship for non-equilibrium versus other flashing stage parameters).
W76-07111

DEVELOPMENT OF NON-CELLULOSIC RO SYSTEMS FOR SEA WATER DESALTING,
Du Pont de Nemours (E.I.) and Co., Wilmington, Del.
N. W. Rosenblatt, J. P. Agrawal, C. R. Antonson, D. C. Brandt, and D. M. Brethauer.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-252 597, $16.25 in paper copy, $2.25 in microfiche. OWRT/S--76/36, November 1975. 632 p, 59 fig, 90 tab, 40 ref, 24 append. 14-30-3233.

Descriptors: Desalination, *Desalination processes, *Membrane processes, *Reverse osmosis, Sea water, *Pilot plants, Desalination plants.
Identifiers: Polyamide hydrazide membranes, Polyamide hollow fiber permeators, Spiral wound modules, Pretreatment, Fouling control, Cost estimates.

Sea water desalting through continued development and testing of the polyamide hydrazide (DP-1) film membrane in a spiral configuration is described. Results of testing of polyamide hollow fiber permeators operating at 800 psi and desalting sea water in a single stage are also discussed. A process to continuously cast assymetric DP-1 film membranes of up to 36 inches width was developed to supply membranes for fabrication of spiral module elements. Small spiral (2 in.) elements desalted seawater at expected flux and rejection levels and maintained stable performance in the field. Most larger (4 in.) elements lost salt rejection rapidly as a result of inadequate flatness of the membrane support (sailcloth) and of wrinkles in the spirally wound leaves. Leads to overcome these deficiencies through use of alternate materials and improved fabrication techniques were demonstrated. Prototype polyamide hollow fiber permeators of 8 in. diameter with fiber-glass reinforced epoxy shells were fabricated. Field tests of 4 in. and 8 in. permeators culminated in the operation of a pilot plant producing 10,000 gpd potable water at Ocean City, New Jersey. System design, pretreatment, operating methods and cleaning procedures to control fouling of the permeators in live sea water are discussed. (OWRT)
W76-07318

FINAL REPORT (DEC 74-JULY 75) PILOT PLANT OPERATIONS, ROSWELL TEST FACILITY, ROSWELL, NEW MEXICO.
Burns and Roe, Inc., Paramus, N. J.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-252 638, $7.50 in paper copy, $2.25 in microfiche. OWRT/S--76/35, (1975). 173 p, 29 fig, 42 tab. 14-30-3296.

Descriptors: *Desalination plants, *Desalination processes, *Membrane processes, *Membranes, *Pilot plants, Reverse osmosis, Brackish water, New Mexico, Operation and maintenance.
Identifiers: Spiral wound membranes, High product recovery, Thin film composite membranes.

Results are presented of operation, maintenance, and development activities associated with testing of several brackish water membrane desalting pilot plants at the OWRT Roswell Test Facility, Roswell, New Mexico during the period December, 1974 through July, 1975. Evaluation tests were conducted with several reverse osmosis pilot units ranging in capacity from 100 gpd to 90,000 gpd. Major testing programs included continued evaluation of a multi-stage high product recovery pilot plant employing three reverse osmosis stages in series and capable of attaining 90 percent recovery. In addition, test results obtained with experimental thin film composite PA-100 and PA-300 membranes in a spiral wound configuration are described. (OWRT)
W76-07319

INSTRUMENTATION GUIDE FOR SEAWATER DISTILLATION PLANTS,
Oak Ridge National Lab., Tenn.
R. P. Hammond.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-252 693, $7.75 in paper copy, $2.25 in microfiche. OWRT/S--76/28, October 1972. 140 p, 48 fig, 15 tab, 61 ref, append. DoI 14-30-2535.

Descriptors: *Instrumentation, Flash distillation, Evaporators, *Desalination plants, *Distillation.
Identifiers: *Instruments manual.

This manual is intended to guide the application of generally available instrumentation to Multistage Flash and Vertical Tube Evaporator types of desalting plants and to serve as a guide to detailed information on specific instruments. It assumes that the instrumentation designer has working knowledge concerning construction and operation of evaporator plants, and competent knowledge of process instrumentation used in these plants. Basic information is presented by means of brief discussions of the advantages and limitations of instrumentation components used in desalting plants. Practical information is presented by means of specific recommendations where appropriate. It is expected that this manual will be of value to an instrument engineer who has little experience with process instrumentation and no experience with distillation plants. It will be necessary for the user of this guide to gain a reasonable knowledge of distillation plant construction and operation. In all cases the information is restricted to the ranges of parameters (temperatures, pressures, etc.) expected to be encountered in desalting evaporators, and does not extend into application of technology above or below these ranges.
W76-07320

HEAT EXCHANGERS AND EVAPORATORS,
Austral-Erwin Engineering Co., Houston, Tex. (Assignee).
R. W. Erwin.
U.S. Patent No. 3,939,036, 8 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 943, No 3, p 1334, February 17, 1976.

Descriptors: *Patents, Water purification, *Desalination, *Evaporation, *Demineralization, Separation techniques, *Heat exchangers, Desalination apparatus, Descaling, Oily water, *Evaporators.

A method of evaporating an aqueous feed solution containing dissolved solids or mineral salts and separating the resulting product into individual compontents without adherence of the solids or mineral salts to any surfaces contacting the aqueous solution is described. The method is carried out in an evaporating and separating apparatus which comprises an evaporating chamber including a confined heating and vaporizing zone having heating elements and succeeding separating chambers or zones separate from the evaporating chamber. The succeeding chambers or zones include separating zones for misty vapors, oily foam, hot oil, oily aqueous solution, and oily aqueous folution solids-slurry. All contacting surfaces of the evaporating and separating apparatus are formed of oil wettable material and all contacting surfaces of the evaporating chamber are formed of substantially zero water adsorbent polymeric fluorocarbon material. The aqueous solution as a continuous medium mixed with sufficient dispersed oil to form a continuous film of oil on all oil wettable contacting surfaces flows upwardly through the confined heating and vaporizing zone and contacts the heating elements, the surfaces of which are substantially zero water adsorbent and totally wetted with a film of oil. A portion of the aqueous solution is converted to water vapor and precipitated solids, thus forming a mixture comprising hot oil, misty vapors, solids, and the remaining aqueous solution. The mixture is then separated into components in succeeding separating zones or chambers. (Sinha-OEIS)
W76-07433

APPARATUS FOR CONTROL OF A REVERSE OSMOSIS SYSTEM,
Desalination Systems, Inc., Escondido, Calif. (Assignee).
D. T. Bray.
U.S. Patent No. 3,939,074, 4 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 943, No 3, p 1345, February 17, 1976.

Descriptors: *Patents, Water purification, *Waste water treatment, Water quality control, *Reverse osmosis, *Membrane processes, Semipermeable membranes, Separation techniques, Water storage, Storage tanks, Hydraulic properties, Valves.

The reverse osmosis system comprises a module containing a semipermeable membrane, a pipe for introducing feed water under elevated pressure into the module, a restrictor or pressure control valve for releasing brine from the module while retaining operating pressure, and a tank for temporarily storing purified water. A valve is provided in the pipe introducing feed water into the module and the pipe transferring purified water from the module to the storage tank. This valve is actuated by means outside the tank for shutting off or turning on introduction of feed water into the module, and thus indirectly transfer of purified water into the storage tank, in response to the amount of purified water in the storage tank. The weight of water in the storage tank is employed for determining the amount, to automatically control actuation of the feed water input valve, or the purified water transfer valve, to maintain a predetermined amount of purified water in the storage tank. Hydraulic head is commonly considered to be a column height producing a pressure or weight of a liquid exerted over a unit area. The means for actuating the valve that controls the feed water input to, or the purified water transfer from the module, dependent on the weight of purified water in the storage tank, is completely outside the storage tank itself. (Sinha-OEIS)
W76-07440

METHOD FOR CLEANING SEMIPERMEABLE MEMBRANES,
Desalination Systems, Inc., Escondito, Calif. (Assignee).
C. C. Macevicz, and C. W. Million.
U.S. Patent No. 3,940,336, 4 p, 2 ref; Official Gazette of the United States Patent Office, Vol 943, No 4, p 1809, February 24, 1976.

Descriptors: *Patents, *Water purification, *Reverse osmoses, *Semipermeable membranes, *Membrane processes, *Desalination, Demineralization, Water quality control, Ion exchange, Resins, Resistivity.
Identifiers: Ultrapure water.

The invention comprises a method for cleaning a semipermeable membrane in a membrane process solution treatment system, in which a surface of such a membrane is cleaned by flushing with ultrapure water, that is water of purity greater than one megohm resistivity, and preferably between about one megohm and about 18 megohms resistivity. Preferably, the surface of a semipermeable membrane is flushed with water of purity greater than one megohm resistivity at a rate between about one-tenth gallon and about ten gallons per hour of water per square foot of membrane area. The flushing time should extend over a period of between about one and about fifteen hours. The membrane is maintained in place in its working assembly such as a cartridge or module, during cleaning. The water of purity greater than one megohm resistivity is produced by deionization of water containing a substantial content of total dissolved solids with an apparatus using ion exchange resin beds or mixed resin beds. (Sinha-OEIS)
W76-07446

3B. Water Yield Improvement

SHALE CHISELING-EFFECT ON WATER YIELD,
Virginia Polytechnic Inst., and State Univ., Blacksburg. Dept. of Agricultural Engineering.
V. O. Shanholtz, J. B. Burford, and E. T. Engram.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 6, p 1100-1104, November-December 1975. 6 fig, 1 tab, 21 ref.

Descriptors: *Chiselling, *Soils, *Water yield, *West Virginia, Shales, Hardpan, Dikes, Subsoil, Runoff, Watersheds(Basins), Calibrations, Pastures, Soil profiles, Precipitation(Atmospheric), Earth dikes.
Identifiers: *Shallow soils, *Shale chiselling, Subsoiling, Linear regression.

Four small watersheds were instrumented to study the effect of chiselling shallow shale soils on water yields. Analysis of monthly water yield data indicated that chiselling reduced water yield by a small but statistically significant amount. Surface flows were reduced as shown from an analysis of selected storm events. However, an analysis of the total flow from the same events showed little change in flow, which strongly suggested that the reduction in surface flow was compensated by increased subsurface movement. The small decrease in water yield which was shown by analysis of the monthly yield data was strongly associated with snow melt. Approximately 77% of the reduction was traced to periods of high snowmelt. No significant change was noted during the summer months when it would have the most agronomic importance. (Roberts - ISWS)
W76-06924

METHOD FOR DETECTING AND LOCATING WATER-PRODUCING ZONES AND/OR WATER THIEF ZONES IN SUBTERRANEAN FORMATIONS,
Continental Oil Co., Ponca City, Okla. (Assignee).
For primary bibliographic entry see Field 4B.
W76-07448

3C. Use Of Water Of Impaired Quality

ACIDITY, ACID SULPHATE SOILS AND LIMING OF PADI FIELDS,
K. Kanapathy.
Malays Agric J. 49(2), p 154-165, 1973.

Descriptors: *Sulfates, *Acidic soils, Hydrogen sulfide, *Saturated soils, *Lime, Fertilizer, *Soil treatment, Application rates, Cultivation, Acidity.
Identifiers: Padi fields.

In order to understand the effect of liming and waterlogging of acid sulfate soils as well as other soils several experiments were carried out. Padi could tolerate acidity to a high degree if Fe and Al were not present in large quantity. H2S had deterimental effects on padi. Water logging decreased acidity of the soil/water. Peaty soils could be more heavily limed than silty soils. The addition of basic substances made soil N more available. The type of cultivation and period of water logging would have great influence on the response of padi to liming on an acid sulfate soil. Liming of acid padi fields would therefore be only an insurance against lack of water. It is recommended that liming be done to bring the soil up to a pH of 4.2 after ascertaining the pH. Most acid sulfate soils give low yields inspite of lime and fertilizer.--Copyright 1975, Biological Abstracts, Inc.
W76-07227

SALT-TOLERANT SILT GRASS (PASPALUM VAGINATUM SW.),
Miami Univ., Coral Gables, Fla.
J. F. Morton.
Proc Fla State Hortic Soc. 86, p 482-490, 1973(1974).

Descriptors: *Grasses, Turf grasses, *Salt marshes, Marshes, *Brackish water, *Saline water, *Irrigation water, *Tropical regions.
Identifiers: Fodder grass, Paspalum-vaginatum, *Salt grass.

Silt grass occurs naturally on muddy seacoasts, in tidal marshes and brackish sandy regions of both hemispheres from Baja California, North Carolina and southern Spain southward. Erect or prostrate in habit, it has a tough, creeping rootstock and forms dense mats. It has been successfully domesticated in Australia, southern Florida and the West Indies and has been introduced into cultivation in Venezuela. Easy to propagate and fast-growing, it makes excellent turf and is an ideal lawn grass for subtropical and tropical areas where irrigation water has an unfavorable salt content. In coastal pastures, it provides nourishing fodder. The dried grass is employed as a tropical American folk remedy.--Copyright 1974, Biological Abstracts, Inc.
W76-07252

INFLUENCE OF FLOODING ON PH, OXIDATION-REDUCTION POTENTIAL AND SOIL PHOSPHORUS AVAILABILITY, (IN PORTUGUESE),
Instituto de Pesquisas e Experimentacao Agropecuarias do Sul, Pelotas (Brazil).
For primary bibliographic entry see Field 5C.
W76-07289

3D. Conservation In Domestic and Municipal Use

MUNICIPAL WATERSHED MANAGEMENT SYMPOSIUM PROCEEDINGS.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 4D.
W76-06812

SLUDGE REMOVAL FROM DRYING BEDS,
For primary bibliographic entry see Field 5D.
W76-07037

SANITARY AND HYGIENIC CHARACTERISTICS OF WATER SUPPLY SOURCES OF THE POPULATION OF THE KUGART RIVER BASIN, (IN RUSSIAN),
Kirgiz Research Inst. of Epidemiology, Microbiology and Hygiene, Frunze (USSR).
For primary bibliographic entry see Field 5F.
W76-07047

DRAINAGE STUDY: HUNTER BROOK, SUCKER BROOK, COLDSPRING BROOK,
O'Brien and Gere Engineers, Inc., Syracuse, N. Y.
For primary bibliographic entry see Field 4A.
W76-07090

COST AND PRICING RELATIONSHIPS IN WATER SUPPLY,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
R. M. Clark.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE2, Proceedings paper No. 12025, p 361-373, April 1976. 7 fig, 5 tab, 1 ref.

Descriptors: *Water quality, *Water reuse, *Statistical methods, *Pricing, *Economics, Planning, Water policy, *Regression analysis, Water supply, Costs, Mathematical models, Systems analysis.
Identifiers: *Water consumption, Regional planning, Systems engineering, Urban planning.

Governmental decision making in metropolitan areas is becoming increasingly concerned with finding comprehensive solutions to area-wide problems. Development of an adequate urban water supply system is such a problem. Although the price, cost and quality of water supply offered by various civil subdivisions in a given metropolitan area may be widely divergent, the factors influencing this service are similar. This paper examines the costs associated with supplying drinking water to consumers, the factors affecting the price of water, and the elasticity of consumer demand based on the prices that they must pay. The cost analysis explores the costs by functional area and the costs of transporting water to the consumer. Factors that affect the price of water such as population density are examined, and the reaction of the consumer to increases in price levels is established. (Bell-Cornell)
W76-07145

URBAN WATER MANAGEMENT AND COASTAL WETLAND PROTECTION IN COLLIER COUNTY, FLORIDA,
Black, Crow and Eidsness, Inc. Gainesville, Fla.
R. L. Wycoff, and R. D. G. Pyne.
Water Resources Bulletin, Vol. 11, No. 3, p 455-468, June 1975. 4 fig, 8 ref.

Descriptors: *Water management(Applied), *Environmental control, *Land use, Hydrology, Surface waters, Planning, Protection, Ecology, Estuaries, Waste water(Pollution), Operation and maintenance, Vegetation, Urban runoff, *Florida.
Identifiers: *Coastal areas, Water flow, Master plan.

Traditional development in South Florida has in many cases resulted in undesirable degradation of terrestrial and aquatic ecosystems, due to overdrainage and overenrichment of surface waters. A study was undertaken in order to establish guidelines under which urban development may take place in coastal areas, while minimizing unwanted environmental changes. The study area consists of approximately 70 square miles of relatively flat land in Collier County, Florida. The coastal wetlands of the region are a highly valued natural resource containing the Rookery Bay Wildlife Sanctuary. The upland properties are mainly pine woodlands and have great potential for development. A master plan was developed which will: (1) provide adequate drainage for existing and projected development within the study area; and (2) maintain the integrity of the estuarine zone. The major recommendations of the plan relate to land use, physical control of surface waters, including construction and maintenance of the water management system, and implementation of the plan. (Bell-Cornell)
W76-07150

ECONOMETRIC MODEL TO AID IN URBAN PLANNING DECISIONS,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia).
For primary bibliographic entry see Field 6A.
W76-07232

METHOD AND APPARATUS FOR TREATING SEWAGE,
Gypsum Industries Ltd., Transvaal (South Africa). (Assignee).
For primary bibliographic entry see Field 5D.
W76-07436

3E. Conservation In Industry

SITING OF ENERGY FACILITIES IN THE COASTAL ZONE -- A CRITICAL REGULATORY HIATUS,
Marshall-Wythe School of Law, Williamsburg, Va.
For primary bibliographic entry see Field 6G.
W76-06819

ENVIRONMENTAL PROTECTION AGENCY - ELECTROPLATING POINT SOURCE CATEGORY (INTERIM STANDARDS).
For primary bibliographic entry see Field 5G.
W76-06829

ENVIRONMENTAL PROTECTION AGENCY, ELECTROPLATING MANUFACTURING POINT SOURCE CATEGORY (STANDARDS OF PERFORMANCE FOR NEW SOURCES).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06830

ENVIRONMENTAL PROTECTION AGENCY - SUGAR PROCESSING POINT SOURCE CATEGORY (INTERIM RULE).
For primary bibliographic entry see Field 5G.
W76-06831

EFFLUENT LIMITATIONS AND GUIDELINES - - PAINT FORMULATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06832

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY (EFFLUENT GUIDELINES AND LIMITATIONS).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06833

WATER RESOURCES PROBLEMS RELATED TO MINING.
American Water Resources, Association, Minneapolis, Minn.
For primary bibliographic entry see Field 5G.
W76-06938

LEGAL PROBLEMS IN THE ACQUISITION OF SUITABLE WATER SUPPLIES FOR OIL SHALE OPERATIONS IN WESTERN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Environmental and Natural Resources Law.
M. D. White.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 12-21. 3 ref.

Descriptors: *Water rights, *Water law, *Legal aspects, *Colorado, *Oil shales, Groundwater, Surface waters, Industrial water, Adjudication procedure, Appropriation, Relative rights, Interstate compacts, Treaties, Judicial decisions, Colorado River Compact, Irrigation, Water contracts, Water reuse, Water resources.

This discussion of the legal problems and techniques involved in the acquisition of suitable water supplies for oil shale operations in western Colorado, concentrated on alternative ways of obtaining water rights: federal reserved rights, salvage water, contract water, initiating one's own appropriation, and purchase of existing water rights. (See also W76-06938) (Sims - ISWS)
W76-06940

WATER PROBLEMS IN ALBERTA OILSANDS DEVELOPMENT,
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 5G.
W76-06953

WATER AND THE BRITISH COLUMBIA MINING INDUSTRY,
Ker, Priestman and Associates, Ltd., Victoria, (British Columbia).
For primary bibliographic entry see Field 5G.
W76-06954

AN INTRODUCTION TO HYDROGEOCHEMICAL EXPLORATION,
For primary bibliographic entry see Field 4B.
W76-06956

FISHERIES IMPLICATIONS OF WATER TRANSFERS BETWEEN CATCHMENTS,
Association of River Authorities (England). MAFF Hydrological Group.
L. G. de Solbe.
Proceedings of the Institution of Civil Engineers, Part 1, Vol. 58, p. 699-700, 1975.

Descriptors: *Fisheries, *Water transfer, *River basins, *Fish diseases, Water temperature, Spawning, Water pollution, Fish population, Salmonids, Fish food organisms, Algae, Fish management, Fish migration, Stream improvement, Flow rates, Europe.
Identifiers: England.

For organisms to remain in balance with their environment, changes in water transfer rates must occur slowly. Effects of pH, hardness, and tem-

perature should be minimal and badly polluted or infected water donors should not be used. Transferred water may contain fish, fry, or eggs which might be predators. Introduction of fishfood organisms could be beneficial, but algae might produce blooms. Transfer might also affect the odor (pherones) of young salmon and affect migration to the salmon's natal river. Intermittent transfers can endanger spawning grounds and severely reduce production. To combat this, transfer flow and velocity might have to be continuous or fish should be prevented from entering danger areas. Engineering work on recipient channels should consider the needs of fish (variety of gradient and depth, bank and aquatic vegetation, food and cover) so that water transfers could benefit fisheries. Optimum flows for angling and fish migration are discussed. Electronic fish counters are being installed to provide data on fish movements. Research is needed on creating freshets or continuing flow with stored water. Improvement of transfer channels so that they would be suitable for fish and development of fisheries is discussed. (Buchanan-Davidson--Wisconsin)
W76-07108

OPTIMIZATION OF EVAPORATION POND COST,
Bechtel Inc., Gaithersburg, Md.
For primary bibliographic entry see Field 5D.
W76-07147

SWINE WASTE NUTRIENT RECOVERY SYSTEM BASED ON THE USE OF THERMAL DISCHARGES,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-07179

FLOOD PROTECTION OF CRYSTAL RIVER UNIT 3 NUCLEAR PLANT,
Dames and Moore, Los Angeles, Calif. Ocean Sciences.
For primary bibliographic entry see Field 4A.
W76-07210

PROBLEMS UNDER STATE WATER LAWS: CHANGES IN EXISTING WATER RIGHTS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 6E.
W76-07233

WASTEWATER REUSE BY CONTINUOUS ION EXCHANGE,
Avco Systems Div., Wilmington, Mass.
For primary bibliographic entry see Field 5D.
W76-07239

3F. Conservation In Agriculture

WILDLIFE, ECOLOGY AND PLANNING IN A PROPOSED IRRIGATION SYSTEM,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 4C.
W76-06804

DISPOSITION OF WATER FROM FRUIT CROPS AND APPROACHES TO INCREASE WATER USE EFFICIENCY,
Florida Univ., Gainesville. Dept. of Fruit Crops.
For primary bibliographic entry see Field 2D.
W76-06807

AHTANUM INDIAN IRRIGATION PROJECT.
Bureau of Indian Affairs, Washington, D. C.
Federal Register, Vol. 39, No. 203, p. 37199 (1974). 1 p.

Descriptors: *Washington, *Maintenance costs, *Water costs, *Indian reservations, *Irrigated land, Irrigation operation and maintenance, Irrigation systems, Irrigation water, Irrigation districts, *Irrigation programs, Federal government, Administrative agencies, Water management(Applied), Operation and maintenance, Operating costs, Operations, Irrigation water, Water distribution(Applied).
Identifiers: *Yakima Indian Reservation(Wash), Ahtanum Indian Irrigation Project(Wash).

The Bureau of Indian Affairs under the authority delegated by the Secretary of the Interior has proposed to change the rate for annual operation and maintenance assessments on the Ahtanum Indian Irrigation Project. The purpose of this modification is to increase the assessment rate to reflect more accurately the actual operation and maintenance costs as reflected by the previous year's operating experience and the anticipated program of work. The operation and maintenance charges of the project, located upon the Yakima Indian Reservation, are fixed at $4.00 per acre per annum for each irrigable acre of land to which water can be delivered from the project works. (Welch-Florida)
W76-06835

INCREASED WATER USE EFFICIENCY THROUGH TRICKLE IRRIGATION,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
E. A. Hiler.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-252 188, $5.00 in paper copy, $2.25 in microfiche. Texas Water Resources Institute, College Station, Technical Report No. 65, June 1975, 72 p. 20 ref, 7 append. OWATB-167-TEX(1). 14-31-0001-4144.

Descriptors: Irrigation, Design, Computer models, *Water utilization, *Irrigation efficiency, Crop response, *Application methods, Computer programs, Water requirements, Water loss.
Identifiers: *Trickle irrigation, Water use efficiency, *Optimum irrigation timing.

Experiments were conducted in a well-instrumented field lysimeter installation to determine optimum irrigation timing and application amounts for best water use efficiencis using trickle irrigation. A Comparison of water use efficiencies under well-watered conditions using intensified and conventional water application methods showed higher water use efficiencies and better crop response when the trickle method was used. Also, the results showed that higher water use ficiencies can be obtained by applying sparing amounts. A computer model was developed to simulate grain sorghum yield and water use under high frequency irrigation. This method can be used to simulate a complete irrigation experiment greatly reducing research costs and allowing the determination of water requirements for many crops under many different soil and climatic conditions. Using the results of the experimental studies as design inputs, two trickle irrigation lateral design methods were developed. With the first method, a computer program was developed to determine lateral pressure loss and emitter flow ratio at a given design length as a function of several pertinent design varibles. In the second method, design equations are utilized to calculate the maximum lateral length for a given uniformity of application coefficient. Dimensionless graphs were developed that can be used to properly design the trickle irrigation laterals.
W76-06904

DECISION ANALYSIS FOR WATERSHED MANAGEMENT ALTERNATIVES,
Arizona Univ., Tucson, School of Renewable Natural Resources.
For primary bibliographic entry see Field 4D.
W76-06905

EVALUATION OF ALTERNATIVE USES OF WETLANDS,
North Dakota State Univ., Fargo. Dept. of Zoology.
J. F. Cassel.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-252 192, $3.50 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report No. WI-221-032-75, November, 1975, 11 p, 1 fig, 2 tab, 10 ref. OWRT-A-039-NDAK(1). 14-31-0001-4034.

Descriptors: *Wetlands, *North Dakota, *Waterfowl, Alternative water use, Evaluation, Wheat, Pintail duck, Crops, Grain(Crops), Feeds, Barley, Mallard duck.
Identifiers: J. Clark Sayler National Wildlife Refuge,(N DAK), Crop degradation, *Feeding behavior (Waterfowl)

Field feeding and depredation by waterfowl were observed in Bottineau County, North Dakota from October 2 to October 14, 1974, in order to provide a general overview of the depredation problem. Estimates indicated that 18 percent of the crop remained to be harvested and that durum wheat and barley made up most of the unharvested grain. Waterfowl populations, concentrated mostly on J. Clark Salyer National Wildlife Refuge, consisted of 50,000 to 60,000 ducks and 33,000 geese. Mallards and Pintails were the only species observed feeding on unharvested grain. Durum and barley appeared to be the most highly preferred grain type and stubble and swathed field the most commonly utilized field type. The major portion of losses appeared to be by trampling of swaths and grain shaken from heads and usually involved small flocks and small portions of damaged field. Most field feeding occurred in early morning and late afternoon. Scaring methods of depredation control were used most commonly during the study period but the feeding program at Salyer Refuge was not in operation at this time. It is suggested that the feeding program at Salyer be extended, the hunting season be opened early during times of severe depredation, local growers be informed of control techniques available and the biology of field feeding waterfowl be further investigated.
W76-06908

RELATIONSHIP OF GEOMORPHOLOGY TO ORIGIN AND DISTRIBUTION OF A HIGH CHARGE VERMICULITIC SOIL CLAY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-06926

CONSIDER THE PLANT IN PLANNING WIND EROSION CONTROL SYSTEMS,
Agricultural Research Service, Big Spring, Tex.
For primary bibliographic entry see Field 4D.
W76-06928

SANITARY-HELMINTHOLOGIC ASSESSMENT OF IRRIGATION WITH SEWAGE BY MEANS OF SPRINKLING, (IN RUSSIAN),
For primary bibliographic entry see Field 5E.
W76-06983

THE INFLUENCE OF IRRIGATION BY MEANS OF DAIRY PLANT SEWAGE POURED OUT OF SPRINKLING PIPES ON THE YIELDS OF SOME PLANTS CULTIVATED ON SANDY SOIL AT LASKOWICE OLAWSKIE, (IN POLISH),
Instytyt Uprawy Nowozenia i Gleboznawstwa, Pulawy (Poland).
For primary bibliographic entry see Field 5D.
W76-07110

EFFLUENT IRRIGATION OF PEARL MILLET,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-07205

ESTIMATION OF THE WATER HYDRATION IN WINTERING WHEAT LEAVES BY PROTON MAGNETIC RESONANCE,
Department of Agriculture, Ottawa (Ontario). Chemistry and Biology Research Inst.
For primary bibliographic entry see Field 2I.
W76-07226

LEAF WATER POTENTIAL RESPONSE TO TRANSPIRATION BY CITRUS,
Instituto Colombiano Agropecuario, Bogota.
For primary bibliographic entry see Field 2D.
W76-07256

STATE OF CYTOPLASMIC PROTEINS OF CORN LEAVES IN DEPENDENCE OF SOIL MOISTURE, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fizilogii Rastenii i Agrokhimii.
S. I. Slukhai, and O. E. Shvedova.
Fiziol Biokhim Kul t Rast. 5(6), p 598-601, 1973.

Descriptors: *Proteins, *Corn(Field), *Soil moisture, Leaves, Cytological studies, Metabolism, Enzymes.
Identifiers: Cytoplasmic proteins.

Lack of plant water at all main phenological stages results in the weakening of high-molecular weight protein synthesis and thus decreases enzyme activity. Simultaneously a part of low-molecular proteins increases which might be due to depression of the high-molecular weight protein synthesis as well as due to intensification of high-molecular weight substance decomposition in the aging leaves. All of these affect plant productivity.--Copyright 1974, Biological Abstracts, Inc.
W76-07267

USE OF COVER CROPS IN ORCHARDS IN CONNECTION WITH THE PROBLEM OF WATER ACCUMULATION IN SOILS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
R. S. Ryabykh.
Vestin Leningr Univ Ser Biol. 28(3), p 113-117, 1973

Descriptors: Crops, *Cover crops, Orchards, Soils, *Soil moisture, *Moisture content, *Apples, Fruit crops, Nitrates, Seasonal, Fertility.

When moisture conditions are insufficient, the summer sowing of the spring cover crops in orchards (recommended by agrotechnical methods) results in very little green mass whereby drying of the soil takes place. The winter cover crops use the moisture of the autumn-winter and early spring precipitation formed during half of the year. These atmospheric precipitations insure the building of a great amount of green mass, without damage to the water conditions of the fruit trees. The green mass is mixed with the soil 10-12 cm deep, before flowering apple trees preserve the water and increase the content of nitrate in the soil during the whole vegetative season. It stimulates the growth and fruitfulness of the trees. If the green mass is ploughed 18-20 cm deep, the effect of the cover crop is lowered.--Copyright 1974, Biological Abstracts, Inc.
W76-07268

WATER REGIME AND CONTENT OF PHOSPHORUS COMPOUNDS OF ACID-SOLUBLE FRACTION IN COTTON LEAVES AT DIFFERENT WATER-SUPPLY LEVELS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
For primary bibliographic entry see Field 2I.
W76-07276

EFFECT OF AERATION ON MICROBIOLOGICAL PROCESSES IN FLOODED SOIL, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. of Microbiology and Virology.
For primary bibliographic entry see Field 2G.
W76-07363

WATER ECONOMY OF A FICTIVE CROP,
Agricultural Univ., Wageningen (Netherlands). Instituut voor Biologisch en Scheikundig Onderzoek van Landbouwgewassen.
For primary bibliographic entry see Field 2D.
W76-07402

PUDDLING AGAINST DRY PLOWING FOR LOWLAND RICE CULTURE IN SURINAM: EFFECT ON SOIL AND PLANT, AND INTERACTIONS WITH IRRIGATION AND NITROGEN DRESSING,
Agricultural Univ., Wageningen (Netherlands). Dept. of Tropical Soil Sciences.
W. Scheltema.
Versl Landbouwkd Onderz (Agric Res Rep). 828, p 1-241, 1974.

Descriptors: *Rice, *Farm management, Clays, Soils, Fertilizers, Nitrogen, Potassium, *Cultivation, Iron, Dehydration, Crop production.
Identifiers: Plowing, *Puddling, *Surinam.

The influence of tillage on rice grown on heavy Surinam clay soils was investigated in pot and field trials. Included were interactions with seed rate, N dressing and distribution, water management and variety. Four procedures for tilled layer and seedbed preparation were studied morphologically, physically and chemically: wet, dry/wet, dry and zero. Differences between tillage treatments were found in sedimented layers, fragmentation, moisture contents, bulk density, dehydration curves, amount of moisture extracted by suction, permeability, moisture potentials, structural stability, content of extractable ammonium and Fe and K concentrations in soil moisture. Plant growth and grain yield were influenced by tillage through seedling establishment and growth, N mineralization in the soil, recovery of applied N in the rice plant, total amount of applied N and its distribution, surface drainage and mutual shading. Shaddow tillage, a few times in tilled layer preparation and a large wooden beam in seedbed preparation gave highest yields. The effect of the easiest procedures-dry and dry/wet tillage-depended on the weather during the operation. The customary dry/wet tillage seemed harmful as it induced mutual shading thus reducing grain yield. Dry tillage was most beneficial to grain yield because of the high recovery of applied N. Wet tillage should be performed only when weather is unfavorable. Zero tillage is practicable, but weed control is troublesome.--Copyright 1975, Biological Abstracts, Inc.
W76-07420

AFTEREFFECT OF SPRING FROSTS ON PROTEIN SYNTHESIS IN WINTER WHEAT LEAVES DEPENDING ON THE FORM OF NITROGENOUS FERTILIZER, (IN RUSSIAN),
Siberian Inst. of Plant Physiology and Biochemistry, Irkutsk (USSR).
A. K. Glyan'ko, and N. V. Mironova.
Fiziol Biokhim Kul't Rast. 6(2), p 180-182, 1974.

Descriptors: Frost, Protein, *Wheat, *Leaves, Nitrogen, Fertilizers, Nitrates, Ureas.
Identifiers: Nitrogen-15, Winter wheat, Nitrate-Ammonium, Nitrogen-nitrate.

Experiments with winter wheat showed that weak (-4, -5C) and severe (-9, -10C) frosts have an inhibitory effect (3 days later) on incorporation of N15 into ethanol-insoluble fraction (EIF) of leaves with plant N-NH4 nutrition. When dressing with urea, incorporation of N15 into EIF is inhibited only during severe frosts and remains unchanged during weak ones. When N-NO3 nutrition is applied to the plants incorporation of N15 is more active during weak frosts and is unchanged during severe ones.--Copyright 1975, Biological Abstracts, Inc.
W76-07422

SOIL MOISTURE REGIME OF LOESSIAL SOILS IN WESTERN GERMANY AS AFFECTED BY ZERO-TILLAGE METHODS,
Goettingen Univ. (West Germany). Faculty of Agriculture.
For primary bibliographic entry see Field 2G.
W76-07437

POP-UP SPRINKLER HEAD HAVING FLOW ADJUSTMENT MEANS,
Toro Co., San Marcos, Calif. (Assignee).
E. J. Hunter.
U.S. Patent No. 3,940,066, 5 p, 16 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 943, No 4, p 1724, February 24, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Flow, Regulated flow, Equipment, Water pressure.
Identifiers: Pop-up sprinkler.

A pressure control device for an irrigation nozzle has a rotatable riser and a nonrotatable valve for regulating the flow and pressure of water through the sprinkler. The riser is sealed at the water inlet end by a suitable plug and a valve ring is snug-fit on the riser. The valve ring is keyed to a filter screen surrounding the riser to remain circumferentially stationary. The valve ring has an orifice which is congruent to the inlet orifice in the riser. The pressure to the entire sprinkler system is adjusted by rotating the riser either manually or by any suitable means. This provides for adjustment of the flow of water through the orifice in the valve ring and then through the inlet orifice in the riser. In an alternative embodiment, a valve disc is secured to the inlet end of the riser and is circumferentially stationary with respect to the riser. The riser has a plug mounted at the inlet end and a key or splined stop on the surrounding filter keys the plug and riser to permit limited rotation. Both the valve disc and the riser have orifices with are congruent. Rotation of the riser with respect to the stationary valve disc regulates the flow of water. (Sinha-OEIS)
W76-07442

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

COMMUNITY RESPONSE TO THE FLOOD DISASTER PROTECTION ACT OF 1973,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Rural Sociology.
For primary bibliographic entry see Field 6F.
W76-06810

EXPERIMENTAL STUDIES OF WING-WALL MIXING CONTROL,
Illinois Univ. at Urbana-Champaign. Dept. of Civel Engineering.
For primary bibliographic entry see Field 5B.
W76-06814

BOOKS ON WATER AND WASTEWATER.
National Center for Scientific and Technical Documentation, Brussels (Belgium).
For primary bibliographic entry see Field 10C.
W76-06816

NATIONAL ATTEMPTS TO REDUCE LOSSES FROM FLOODS BY PLANNING FOR AND CONTROLLING THE USES OF FLOOD-PRONE LANDS.
General Accounting Office, Washington, D.C.
For primary bibliographic entry see Field 6F.
W76-06822

DIFFUSED SURFACE WATERS IN MISSISSIPPI,
For primary bibliographic entry see Field 6E.
W76-06823

SAMPLE FLOOD PLAIN ZONING ORDINANCE FOR LOCAL UNITS OF GOVERNMENT.
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 6F.
W76-06828

AHTANUM INDIAN IRRIGATION PROJECT.
Bureau of Indian Affairs, Washington, D. C.
For primary bibliographic entry see Field 3F.
W76-06835

MONTANA WATER USE ACT.
For primary bibliographic entry see Field 6E.
W76-06839

SPECIAL FLOOD HAZARD INFORMATION REPORT ON SHINGLE CREEK, OSCEOLA AND ORANGE COUNTIES, FLORIDA.
Army Engineer District, Jacksonville, Fla.
Prepared for the Boards of County Commissioners of Osceola and Orange Counties, January 1970. 7 p, 5 plates, 1 tab.

Descriptors: *Floods, *Flood plains, *Historic floods, *Flood flows, *Flood profiles, Runoff, Storms, Hurricanes, Flood data, Flood frequency, Peak discharge, Channel improvement, *Florida.
Identifiers: Osceola County(FL), Orange County(FL), Orlando(FL). Kissimee(FL), Shingle Creek(FL), Clear Lake(FL), Lake Tohopekaliga(FL), Standard Project Flood, Intermediate Regional Flood.

Shingle Creek, in Orange County, Florida, flows from its headwater at Clear Lake to its mouth at Lake Tohopekaliga just below Kissimmee and drains an area of 180 square miles. Only the eastern haf of the basin drained by the 11.59 mile long main stem of Shingle Creek is considered in this report. Part of the City of Orlando is in the northern section of the basin. Consequently, the flood plain contains urban development in this northern section. Other non-agricultural development is centered around Kissimmee. The rest of the area is largely undeveloped or in agricultural uses (pastures and citrus groves). Flooding can occur as the result of prolonged seasonal rainfall and tropical hurricanes. The discharge capacity of Shingle Creek is inadequate to handle even the runoff from a moderate storm, and some flooding occurs almost yearly. Since 1945, 10 damaging floods have occurred with the worst occurring in March 1960 when flood elevations recorded 71.66 feet above mean sea level, or 5.7 feet above average flood stage. Peak discharge reached 3,320 cubic feet per second and homes and streets were inundated. The estimated frequency of this flood stage occurring is once in 25 years. 'Under 1960 land useconditions, 800 acres of urban development, 3,000 acres of improved pastures, and 100 acres of citrus groves are subject to flooding.' Estimated flood profiles for the Intermediate Regional Flood and Standard Project Flood are given. Population projections indicate that Orange County is expected to increase from its present population of about 360,000 to 470,000 by 1980 and 575,000 by 1990. Osceola County is expected to increase from the present 31,500 to 64,700 by 1990. (Henley - North Carolina)
W76-06914

FLOOD PLAIN INFORMATION: COASTAL AREAS, MARTIN COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
Prepared for the Board of County Commissioners of Martin County, June 1973. 30p, 14 plates, 8 fig, 4 tab.

Descriptors: Floods, *Tidal waters, Tides, *HUrricanes, *Flood plains, *Non-structural alternatives, *Flood profiles, Waves, Flood plain zoning, Peak elevation, Historic floods, Flood frequency, Flood plain damage, Warning systems, Building Codes, Shores, Flooding, Storms, *Florida.
Identifiers: Tidal flooding, Wave runup, Martin County(FL). Atlantic Ocean, Stuart(FL), St. Lucie River(FL), Indian River(FL), Intracoastal Waterway(FL), Standard Project Tidal Flood, Standard Project Hurricane, Intermediate Regional Tidal Flood, Intermediate Regional Hurricane.

The coastal portion of Martin County (1970 population 28,035) is subject to tidal flooding from hurricanes and tropical storms and to freshwater floods due to intense rainfall. This report id devoted exclusively to discussion of tidal flooding which can occur from June to November as the result of hurricanes and tropical storms. Tidal floods are generally more damaging than freshwater floods due to the action of waves and the corrosive properties of salt water. Five damaging tidal floods have occurred since 1928; one in September 1949 did $4 million damage to Martin County. A high water mark of 8.5 feet was reported near Stuart and of 160 mph winds were reported. The Intermediate Regional Hurricane would typically have winds reaching 108 mph and a minimum central pressure of 27.3 inches. The Intermediate Regional Tidal Flood would have a peak elevation of 7 ft above mean sea level in the Indian and St. Lucie Rivers and would have runups of up to 12 ft above sea level on beaches with moderately steep slopes. The Standard Project Hurricane would have winds reaching 113 mph and a minimum central pressure of 26.9 inches. The Standard Project Tidal Flood would have a peak elevation of 8 ft msl in the Indian and St. Lucie Rivers and runups of up to 12 ft msl. The SPF and the IRF would flood 4,500 and 4,000 built-up acres respectively. Flood plains on Hutvchinson and Jupiter Islands currently are sparsely developed; flood plains on the mainland in the vicinity of Stuart are well developed and development is increasing at a rapid rate. Martin County currently has zoning ordinances, building codes, and other regulatory measures adopted for reduction of flood damages. (Henley - North Carolina)
W76-06915

SPECIAL FLOOD HAZARD INFORMATION: VERNONBURG, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for the City of Vernonburg, January 1972. 6 p, 3 plates.

Descriptors: *Floods, *Hurricanes, *Tides, Winds, *Tidal waters, Flood frequency, Flood peak, Erosion, Flood plains, Flood protection, Flood plain zoning, Floodproofing, *Georgia.
Identifiers: Flood plain management, Intermediate Regional Flood Tide, Standard Project Flood Tide, *Vernon River(GA).

Vernonburg, a residential community of 136 located 8 mi south of Savannah on the Vernon River, is subject to frontal assault from hurricane wind and erosion caused by high velocity wave action. The area is subject to tidal surges, since the town is only 21 ft above mean sealevel at maximum. Historic large floods have occured here though little data on tidal heights exists. A storm in 1893 had a height of 17 ft above mean sea level. During hurricanes or tropical storms having a magnitude of Intermediate Regional Flood Tide homes and streets located adjacent to marshes in the area would be subject to severe damage. Statistical studies using records of hurricanes and tide gaging stations indicate that Intermediate Regional Flood Tide will average 5.5 ft less than the 1893 flood. A Standard Project Flood Tide would be only slightly larger than the 1893 flood with tidal elevation estimated at about 17 ft msl. It is recommended that appropriate regulations be adopted to guide development in flood-prone areas. (Smith - North Carolina)
W76-06916

FLOOD PLAIN INFORMATION: HOCKANUM RIVER, VERNON, CONNECTICUT, TECHNICAL REPORT.
Buck and Buck, Hartford, Conn.
Prepared for New England Division, Army Corps of Engineers, Waltham, Mass. June 1966. 30 p, 22 fig, 10 plates.

Descriptors: Floods, *Flood plains, *Flood profiles, *Flood stages, *Flood forecasting, Storms, Historic floods, Flood frequency, Flood damage, Flood protection, Warning systems, Non-structural alternatives, Flood proofing, *Connecticut.
Identifiers: *Hockanum River(CN), Vernon(CN), *Shenipsit Lake(CN), Tankerhoosen River(CN), Ogden Brook(CN), Standard Project Flood, Manchester(CN), Talcottsville(CN), Ellington(CN).

The Hockanum River (drainage area 48 sq mi) enters the town of Vernon at its northeast corner at the foot of Shenipsit Lake (drainage area 16.5 sq mi) and has a total reach length in Vernon of approximately 5 miles. The available storage in Shenipsit Lake at the time of severe storms has a tremendous effect on flooding along Hockanum River. The Tankerhoosen River and Ogden Brook, both tributaries of the Hockanum River, are susceptible to flash flooding. The flood plains of the Hockanum, with a minimum width of 150 ft, are relatively undeveloped and contain a few buildings, including some commercial buildings at Manchester town line. A few residences are within the Standard Project Flood limits. Flood flows can be obstructed by bridges, culverts, and vegetation. The only flood on record doing appreciable damage occurred in September 1938, and had a peak discharge of 5,160 cubic ft/sec at the East Hartford Gaging Station. This flood, the result of hurricane rains of 14.7 inches in a 4 day period, has a 1% chance of occurrence in any year. By comparison, the SPF would have a peak discharge of 7,150 cfs. Flood profiles are developed using Benson's equation for peak discharge. Though the Vernon Fire District Planning Commission uses subdivision regulations to control flood plain development, this report suggests extensive guidelines and controls for reducing flood damages which include controlling the filling of the flood plain, encroachment limits, flood plain zoning, flood proofing, and channel maintenance. (Henley - North Carolina)
W76-06917

FLOOD PLAIN INFORMATION: CACHE LA POUDRE RIVER, COLORADO, VOLUME I, FORT COLLINS, LARIMER COUNTY.
Army Engineer District, Omaha, Nebr.
Prepared for Larimer-Weld Regional Planning Commission, October 1973. 25 p, 14 fig, 15 plates, 5 tab.

Descriptors: Floods, *Flood flow, *Flood plains, *Flood profiles, *Snowmelt, *Flood forecasting,

Runoff, Storms, Historic floods, Flood stages, Flow duration, Flow characteristics, Flood damage, *Colorado.
Identifiers: *Cache La Poudre River(CO), Dry Creek(CO), Fort Collins(CO), Larimer County(CO), Spring Creek(CO), Laporte(CO), Standard Project Flood, Intermediate Regional Flood.

This study reach of Cache La Poudre River in Larimer County extends 15.4 miles from a point near the river gage upstream of Laporte to the Spring Creek confluence at Fort Collins. The river in this reach drains an area of 1,055 sq mi and has a slope of 16 ft/mi. The flood plain is not extensively developed; much of the included area could be utilized for safe use. Fort Collins has acquired some flood prone lands for use as open space areas. Continued growth of Fort Collins (population 51,125) is expected to bring development pressure to the flood plains. Presently, thirteen bridges, roadway embankments, residential and commercial structures can obstruct flood flows. Flooding can occur from May through September as the result of intense rainfall. Flooding is most likely to occur in June when rainfall and snowmelt runoff combine to produce flood flows. The river through Fort Collins begins to exceed channel capacity at a peak discharge of about 5,000 cubic feet per second. The Intermediate Regional Flood and the Standard Project Flood would have peak discharges of 19,700 and 60,000 cfs respectively, at the downstream limit of study reach, and would subject residential, commercial, utility and public property to flooding. At Fort Collins peaking will normally occur due to heavy rainfall in about 6 hours with 30 hour duration. Below Watson Lake where the flood plain is relatively narrow and velocities are high overbank flows will be dangerous. A major flood last occurred in 1904. (Henley - North Carolina)
W76-06918

FLOOD PLAIN INFORMATION: NAUGATUCK RIVER, ANSONIA, SEYMOUR, BEACON FALLS, NAUGATUCK, WATERBURY, WATERTOWN AND THOMASTON, CONNECTICUT.
Army Engineer District, Waltham, Mass.
June 1973. 36 p, 20 fig, 12 plates, 5 tab.

Descriptors: *Flood plains, *Flood flows, *Dams, *Flood profiles, *Flood data, *Flow characteristics, *Flash floods, Flood stages, Historic floods, Runoff, Storms, Erosion, Channel, Warning system, Flow duration, *Connecticut.
Identifiers: *Naugatuck River(CN), Beacon Falls(CN), Naugatuck(CN), Waterbury(CN), Watertown(CN), Thomaston(CN), East Branch Naugatuck River(CN), Standard Project Flood, Intermediate Regional Flood.

Portions of the city of Waterbury, largest community in the watershed with a population of 108,033, and the towns of Ansonia, Seymour, Beacon Falls, Naugatuck, Watertown, Thomaston, Connecticut, are subject to flooding from the Naugatuck River (reach length of 50 miles, drainage area of 312 sq mi) and its tributaries, the East and West Branches of the Naugatuck River, Leadmine Brook, Branch Brook, Hancock Brook, Steel Brook, Mad River, Hop Brook, Bladens River and Little River. Significant industrial and residential development in Waterbury, Ansonia, and Naugatuck are subject to flooding. Flood plain open spaces may come under pressure for future development. Connecticut has established channel encroachment lines along the Naugatuck River. None of the towns in the study area have regulatory measures specifically for flood reduction. Flooding can occur in any month with intensity of rainfall, rather than volume, normally determining the magnitude of flood peaks. Previous major floods have crested within 5 to 8 hours. The flood of August 1955 with a peak discharge of 112,000 cubic feet per second claimed 36 lives, damaged 2,200 buildings, and did $193 million damage. Since 1955 the Corps of Engineers has completed 7 flood control dams and has succeeded in protecting most of the flood plain subject to the 100 year flood. Modified peak discharges during the Intermediate Regional Flood and Standard Project Flood would be 23,000 and 58,000 cfs respectively, and would nevertheless flood residential, commercial and industrial sections. SPF channel and overbank velocities would be 10-20 and 2-4ft/sec respectively. (Henley-North Carolina)
W76-06919

SPECIAL FLOOD HAZARD INFORMATION: RAES CREEK, AUGUSTA AND RICHMOND COUNTY, GEORGIA,
Army Engineer District, Savannah, Ga.
Prepared for the City of Augusta and Richmond County, Georgia, January 1974. 25 p, 18 fig, 21 plates, 2 tab.

Descriptors: *Floods, *Flood plains, *Flood profiles, *Flood damage, *Flood peak, Flow characteristics, Non-structural alternatives, Flood proofing, Flood data, Peak discharge, Storms, Hurricanes, *Georgia.
Identifiers: Augusta(GA), Richmond County(GA), *Raes Creek(GA), Savannah River(GA), Cane Creek(GA), Intermediate Regional Flood, Standard Project Flood.

This report presents the flood situation along 7.5 miles of Raes Creek from its mouth on the Savannah River to Wrightsboro Road, 5 mile of Cane Creek from its mouth on Raes Creek to Interstate Highway 20, and 1 mile of the unnamed tributary from its mouth on Raes Creek to Oberlin road all in the vicinity of Augusta, Georgia (Population 70,650). Continued growth and industrial development is expected. The study area with a drainage area of 19.7 sq mi is highly developed and subject to flooding in all seasons of the year as the result of general rainfall, thunderstorms, and hurricanes. Development is taking place on the flood plain. Floods are generally characterized by a rapid rate of rise and high velocities. The Intermediate Regional Flood and the Standard Project Flood on Raes Creek would have peak discharges of 4,200 and 10,500 cubic ft/sec respectively. The IRF would flood residential, commercial and industrial properties covering 450 acres; the SPF would be disastrous, flooding 650 acres. Streets, roads, and public and private utilities would also be damaged. Development in the flood plain is expected to continue, resulting in an increase in storm runoff because of reduced infiltration, a reduction in the channel capacity due to increased deposits of sand and silt, and an increase in peak runoff rates because of the more efficient drainage system. This report suggests 'reasonable regulations' for guiding and controlling developments in flood hazard areas to prevent increases in flood damage in the future. 'Corrective measures may include flood proofing to make existing and proposed structures less vulnerable'. (Henley-North Carolina)
W76-06920

FLOOD PLAIN INFORMATION: KASKASKIA RIVER AND DRY FORK CREEK, DOUGLAS COUNTY, ILLINOIS, NO. 2.
Army Engineer District, St. Louis, Mo.
Prepared for County of Douglas, February 1974. 29 p, 7 fig, 18 plates, 5 tab.

Descriptors: *Floods, *Floodwater, *Flood profiles, *Flood plains, Streamflow forecasting, Historic floods, Peak discharge, Flow characteristics, Thunderstorms, Channel improvement, Dredging, *Illinois.
Identifiers: Standard Project Flood, Intermediate Regional Flood, *Kaskaskia River(IL), Douglas County(IL), Dry Fork Creek(IL).

The properties along these streams are agricultural, there being no industrial development at present and no development plans. Dry Fork Creek, with a total drainage area of 23 sq mi, is a tributary of the Kaskaskia River which drains 329 sq mi and flows eventually into the Mississippi River. Highwater has occurred in all seasons of the year, but flooding has occurred most often in April through June. Flooding results from intense thunderstorms after previous rainfall has saturated the ground. Floods occur in winter when intense rain falls on frozen ground. At least 8 floods occurred between 1943 and 1973, the largest recorded one being the flood of 1959 with a peak discharge of 4400 cfs. Four stream gages have been in operation for only a short time so that future floods were predicted using characteristics of the watershed and data from similar watersheds. During an Intermediate Regional Flood a peak discharge of 12,275 cfs is expected on the Kaskaskia River downstream of confluence with Dry Fork Creek, and 2295 cfs at the mouth of the Dry Fork Creek. Water velocities would vary between 1 and 6 ft/sec in the channel and 1 to 3 ft/sec in the overbank area. It is expected that maximum height would be reached in 7 hours, and the critical stage would last 35 hours. During a Standard Project Flood peak flows of 29,060 cfs and 7550 cfs are predicted on Kaskaskia River and Dry Fork Creek respectively. Maximum height would be reached in 11 hours and critical stage would last 63 hours. Most of the 21 bridges in the area would be obstructive in either major flood. Farms, houses and railroads would be subject to damage. (Smith - North Carolina)
W76-06921

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: FERNOW EXPERIMENTAL FOREST, W. VIRGINIA,
Forest Service (USDA), Parsons, W. Va. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W76-07021

FOREST MANAGEMENT AND NUTRIENT CYCLING IN EASTERN HARDWOODS,
Forest Service (USDA), Parsons, W. Va. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W76-07025

HANDBOOK OF FORECASTING TECHNIQUES,
Stanford Research Inst., Menlo Park, Calif. Center for the Study of Social Policy.
For primary bibliographic entry see Field 6A.
W76-07062

ON THE WATER CHANNELS OF THE INTERNAL DRAINAGE SYSTEM OF THE HINTEREISFERNER, OTZTAL ALPS, AUSTRIA,
Geselischaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie.
For primary bibliographic entry see Field 2C.
W76-07064

RECOGNITION AND PREDICTION OF RUNOFF-PRODUCING ZONES IN HUMID REGIONS,
Agricultural Research Service, Danville, Vt.
For primary bibliographic entry see Field 2E.
W76-07073

DRAINAGE STUDY: HUNTER BROOK, SUCKER BROOK, COLDSPRING BROOK,
O'Brien and Gere Engineers, Inc., Syracuse, N. Y.
R. E. Copeland, and C. A. Richardson.
Report to Cayuga County Planning Board, Auburn, New York, June 1974. 44 p, 5 append. HUD CPA-NY-02-36-1001.

Descriptors: *Drainage, *Drainage programs, *Drainage engineering, *New York, Drainage systems, Surface waters, Watersheds(Basins), Streamflow, Runoff, Floods, Planning, City planning, Regional development, Water policy.

Identifiers: *Auburn(NY), *Cayuga County(NY).

This report identified present and future drainage problems and indicated the need for further study of drainage conditions in the Auburn, New York, area. Existing channel and culvert capabilities in the Hunter Brook Watershed are inadequate. Therefore no additional storm water from future development should be added to Hunter Brook. Field observations and detailed studies of the Sucker Brook Watershed led to recommendation that the proposed Auburn Estates project be drained into Sucker Brook. Investigation of Coldspring Brook Waterhsed indicated that existing drainage features are presently inadequate even for minor storms. Adequate drainage feature improvement combined with storage capacity of existing marsh area would minimize flooding problems. Other areas were briefly examined and existing and potential flooding problems can be avoided by adequate planning. A separate Drainage Review Board subordinate to the Cayuga County Planning Board should be established. (Sims - ISWS)
W76-07090

SPILLWAY FOR LITTLE GOOSE DAM, SNAKE RIVER, WASHINGTON, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-07094

CONFLICT AND COALITION: POLITICAL VARIABLES UNDERLYING WATER RESOURCE DEVELOPMENT IN THE UPPER COLORADO RIVER BASIN,
California Univ., Santa Barbara. Dept. of Political Science.
D. E. Mann.
Natural Resources Journal, Vol. 15, No. 1, p. 141-169, 1975. 2 tab., 52 ref.

Descriptors: *Colorado River compact, *Political aspects, *Water resources development, *Colorado River Basin, Colorado, New Mexico, *Utah, Wyoming, History, Motivation, Decision making, Governmental interrelations, Water allocation(Policy), Preferences(Water rights), Interstate compacts, Water policy.
Identifiers: *Upper Colorado River Basin, Echo Park(Utah), Dinosaur National Monument(Utah).

Upper Colorado River Basin development is characterized as a reflection of distributive and regulative politics. Distributive politics involve a process of bargaining and accomodation among local interests to provide a united front on a basic legislative proposal in order to remove sources of conflict to passage of the bill. There is very little confrontation since the losers, the taxpayers, seldom have an effective voice in this type of political process. Regulatory politics usually involve sectional rather than local interests, involve issues of public policy, and tend to be fought by national associations. The policy implications are discussed more openly as each side attempts to broaden the conflict in order to gain allies. Examination of the history of the bargaining between interests in Colorado, Utah, New Mexico, and Wyoming and of the passage of the proposals shows the impact of the political distributive framework except when certain conservation or interregional issues are raised. The proposed dam at Echo Park in Dinosaur National Monument caused a major struggle with conservation groups and brought the Colorado Basin Projects into the arena of regulatory politics. Despite this occasional shift, the Colorado River Projects and water politics in general, continue to follow distributive politics thereby avoiding a critical examination of overall costs and benefits as well as possible alternatives. (Luedtke-Wisconsin)
W76-07109

FLOOD PLAINS OF THE SOUTH BRANCH SHIAWASSEE RIVER, LIVINGSTON COUNTY, MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 2E.
W76-07113

FLOODS IN PALATINE QUADRANGLE, ILLINOIS,
Geological Survey, Champaign, Ill.
For primary bibliographic entry see Field 7C.
W76-07116

WATER RESOURCES OF THE RIVER RAISIN BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C.
W76-07118

FLOODFLOW CHARACTERISTICS AT BRIDGE SITE ON INTERSTATE HIGHWAY 80, THE GREEN RIVER NEAR GREEN RIVER, WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4C.
W76-07120

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 1. SURFACE WATER RECORDS--VOLUME 1.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-07121

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 5. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--VOLUME 1. HUDSON BAY BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-07122

FLOODS IN NEW YORK, 1972, WITH SPECIAL REFERENCE TO TROPICAL STORM AGNES,
Geological Survey, Albany, N. Y.
For primary bibliographic entry see Field 2E.
W76-07123

INDEX OF SURFACE WATER STATIONS IN TEXAS, JANUARY 1976.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-07127

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1976.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-07128

REVISED ESTIMATES OF MEAN-ANNUAL RUNOFF AND SUMMARY OF PRECIPITATION AND DISCHARGE DATA FOR POST HEADQUARTERS AREA, WHITE SANDS MISSILE RANGE, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 7C.
W76-07131

THE USE OF GROUND-WATER RESOURCES IN RIVER BASIN DEVELOPMENT,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4B.
W76-07132

RIVER BASIN PLANNING - BASIC CONCEPTS FOR DECISION ANALYSIS AND PLANNING FOR GRADUAL EXPANSION OF THE INFORMATION BASE,
Economic Commission for Asia and the Pacific, Bangkok (Thailand).
R. C. Price.
UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Working Paper No. 46, Budapest, Hungary, September 1975. 23 p, 3 fig, 1 tab, 6 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *River basins, *Planning, *Decision making, *Multiple-purpose projects, *Water resources, Economics, Social aspects, Environmental effects, Evaluation, Information exchange.
Identifiers: Project expansion, Information base, Developing countries, Lower Mekong Basin.

For decision analysis and evaluation in river basin planning, the basic concept should involve the economic appraisal of all effects, favorable and unfavorable, economic, social and environmental. Such impacts may be at project site, upstream (i.e., in the reservoir flow), or downstream from the site. If, instead, an attempt is made to evaluate economic aspects on one hand and environmental aspects on the other, there is no common ground left for evaluation and decision assistance. The updating of the data base is as continuous as the river basin planning process itself. In early stages of planning, it is essential that collection of engineering, economic, social and environmental data be kept at a reconnaissance level to avoid waste of funds and effort. As the alternatives become more clearly defined and limited in the planning process, data are needed at feasibility level, so as continually to define the alternatives more precisely, along with their costs, benefits, social impacts and environmental effect. (Bell-Cornell)
W76-07133

ENVIRONMENTAL IMPLICATIONS OF RIVER BASIN DEVELOPMENT INCLUDING WATER QUALITY MANAGEMENT: GENERAL REPORT,
Fordham Univ. Bronx N. Y. School of Law.
For primary bibliographic entry see Field 5G.
W76-07134

LEGAL AND ADMINISTRATIVE CONTROL OF THE IMPACT OF RIVER BASIN DEVELOPMENT ON THE ENVIRONMENT,
Fordham Univ. N. Y. School of Law.
L. A. Teclaff.
Working Paper No. 35, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 23 p, 36 ref.

Descriptors: *River basin development, *Environmental effects, *Environmental control, *Legal aspects, Projects, Evaluation, Federal legislation, Cost-benefit analysis.
Identifiers: Developing countries, Administrative control, Environmental impact statements.

The benefits of river basin development are indisputable and have become so widely recognized that it was a long time before any adverse environmental effects began to be acknowledged. Systematic efforts to minimize such adverse impacts have so far been undertaken mainly in the industrialized countries, but some of the most severe damage has been caused in developing areas; rational water resources planning and management everywhere should take into account as many environmental factors and impacts as possible. Among the legal and institutional concepts devised to afford protection to the environment from large-scale water development are: consolidation and coordination of water resources management with environmental protection administration; the environmental impact statement; standards for the quantification of environmental factors so as to

permit comparison with factors traditionally incorporated in benefit-cost analysis; and guidelines for monitoring environmental impacts and evaluating ongoing and completed projects. Developing countries realize the importance of considering environmental effects, as is shown by one very recent national code. However, they often lack a data base and personnel adequate for achieving the complicated weighing of alternatives in an environmental context. U.N. agencies and international development organizations could do much to help by providing technical assistance and by evolving their own environmental evaluation procedures and standards for the river basin projects which they plan and carry out in developing countries. (Bell-Cornell)
W76-07135

THE ROLE OF PREDICTIONS IN WATER RESOURCES POLICY MAKING,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
A. Szollosi-Nagy.
Working Paper No. 57, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 38 p, 3 fig, 3 tab, 37 ref, append.

Descriptors: *Runoff, *Control, *River basins, *Dynamic programming, *Stochastic processes, *Planning, Decision making, Algorithms, Methodology, Water quality control, Equations, Measurement, Hydrology, Linear programming, Biochemical oxygen demand, Mathematical models, Systems analysis, Optimization, Risks.
Identifiers: Prediction, Operating policies, System performance, Streeter-Phelps equation.

To get an effective control of large river basin systems, the decision maker wishes to develop optimal operating policies. To establish these policies, the future behavior of inputs, such as available resources, demand to be satisfied, etc., must be known or predicted. Because of the uncertainties inherent in water resources processes, both in quantity and quality, the prediction scheme to be constructed should be able to handle stochastic effects. Moreover, the algorithms should be recursive to avoid cumbersome computations and to be able to be used for real-time forecasting. This is especially important in case of emergency, e.g., flash floods. A general state space based formulation of water resources systems is given. It is shown that the general model of runoff control systems is able to handle different kinds of uncertainties. Optimal sequential prediction algorithms for linear discrete time stochastic water resource systems are presented. In the framework of runoff control, the case of optimal stochastic dynamic water quaity control is discussed and feedback control policies are established. The algorithms proposed might help the decision maker in working out the optimal operating policies for a large river basin system in the presence of different kinds of uncertainties. (Bell-Cornell)
W76-07136

INTERBASIN TRANSFER OF WATER RESOURCES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
I. Belyaev.
Working Paper No. 56, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 69 p, 11 fig, 11 tab, 45 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *Water resources, *Inter-basin transfers, *Runoff, Technology, Economics, Ecology, Projects, Evaluation, Systems analysis, Hydrology, Rivers, Lakes, Oceans, Water quality, Management, Water policy, Water utilization, Colorado River, Human population, Planning, United States, Mexico, Mathematical models, Decision making.
Identifiers: Foreign countries.

This report gives an account of the present state of interregional interbasin river runoff transfers which are regarded as elements of natural and existing political-economic systems. The most well-known river runoff transfers on all continents are outlined along with their causes. They are: uneven and inadequate geographical distribution of water and other natural resources, uneven economic development of different regions, and uneven distribution of water resources over time. The alternatives of river runoff transfers are considered from the view point of resources of different types of water, the nature of their present use and the emergence of the relevant technical, economic and ecological problems. It is shown that transfers are often technically and economically preferable and have more obvious biological consequences than many other measures. Under certain circumstances, they are the only means of obtaining necessary amounts of water. Analysis of recently implemented and planned river runoff transfers reveals three important tendencies: (1) the requirements for transfer volumes increase; (2) more distant sources are being used; and (3) transfer projects become multipurpose. These tendencies cause complication of physical, engineering, economic, social and institutional aspects of the problem and complication of the design and management of systems. This paper deals with some modern methods of analysis and evaluation of transfer projects, including the system approach to the problem. (Bell-Cornell)
W76-07137

THE INTEGRATED RIVER BASIN CONCEPT AND INTERNATIONAL WATER RESOURCES MANAGEMENT,
United Nations Centre for Natural Resources, Energy and Transport, New York.
J. Souto-Maior.
Working Paper No. 59, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975, 16 p. (United Nations, Department of Economic and Social Affairs).

Descriptors: *River basin development, *Water resources, *Management, *Planning, *International waters, Evaluation, Regions, Water quality control, Economics.
Identifiers: Drainage basins, National, International.

There are two closely related concepts which, although no longer strongly advocated in national water planning, are still much in vogue among those concerned with international drainage basin development. The first is the concept of the river basin as the appropriate unit for planning, not only water resources development, but also for regional development in general. The second is the concept of integrated river basin development proper. This paper discusses the viability of these concepts in international situations in the light of recent developments both at the national and international levels. The approach followed lays no claim to comprehensiveness. It consists of the evaluation of the drainage basin as a unit for planning and management where regional economic development is a goal, a typical situation among developing countries, and when it is used for water quality management, a common case among industrialized countries at present. The primary purpose of the paper should be considered the stimulation of discussion on these most critical issues. (Bell-Cornell)
W76-07138

EX POST EVALUATION OF THE SOCIO-ECONOMIC EFFECTIVENESS OF LARGE WATER RESOURCES PROJECTS,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 6B.
W76-07139

TOWARDS OPTIMAL DECISION STRATEGIES FOR REDEVELOPMENT PROGRAMS: A CASE STUDY,
Vrije Universiteit, Amsterdam (Netherlands). Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-07140

SIMPLIFIED OPTIMIZATION OF WATER SUPPLY SYSTEM,
Nielsen and Rauschenberger A/S, Lyngby, Denmark.
H. J. Rasmusen.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE2, Proceedings paper No. 12026, p 313-327, April 1976. 5 fig, 10 tab, 8 ref.

Descriptors: *Water distribution(Applied), *Water supply, *Environmental engineering, *Optimization, Economics, Design, Pipelines, Pumping, Energy, Costs, Mathematical models, Equations, Systems analysis.
Identifiers: *Cost minimization.

A heuristic procedure for optimization of large-scale water supply network systems is presented. The method calculates a least-cost solution, considering the total discounted present value of pipeline investments and the running cost of maintaining the desired supply pressure. To solve the optimization problem the iterative procedure is applicable to branched as well as to looping networks. Herein, the diameter of each pipe sequentially is adjusted according to the ratio between marginal pipeline and energy costs. No rounding of diameters is required since available dimensions are used directly in the optimization. The procedure assumes that all nodal inflow and outflow requirements are known and that minimal service pressure requirements are specified. This methodology has been implemented and successfully applied to economic optimization of several large-scale water supply problems. (Bell-Cornell)
W76-07144

HYDROLOGIC AND ECONOMIC SIMULATION OF FLOOD CONTROL ASPECTS OF WATER RESOURCES SYSTEMS,
Hydrologic Engineering Center, Davis. Calif.
B. Eichert.
Technical Paper No. 43, The Hydrologic Engineering Center, Corps of Engineers, U.S. Army, Davis, California, August 1975. 8 p, 1 tab.

Descriptors: *Water resources, *Simulation analysis, *Hydrologic aspects, *Economics, *Flood control, Computer models, Computer programs, Flood damage, Reservoir operation, Evaluation.

The general capabilities and recent applications of the Hydrologic Engineering Center's computer model titled 'Simulation of Flood Control and Conservation Systems' (HEC-5C) are presented. The need for and the general capabilities of the model for detailed hydrologic and economic simulation of all types of water resource projects for flood damage reduction are stressed. The use of the model for planning studies that include alternatives such as reservoirs, levees, channel modifications, flood proofing, evacuation, and land use controls are described. Recent applications of the model in planning studies for several river basins are described. Comments on work underway to use the model for day-to-day reservoir operation during flood emergencies for existing flood control reservoir systems are offered. (Bell-Cornell)
W76-07148

HEC-5C, A SIMULATION MODEL FOR SYSTEM FORMULATION AND EVALUATION,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 6A.
W76-07149

THE SOUTHEAST FLORIDA EXPERIENCE IN RESOLVING DEVELOPMENT AND ENVIRONMENT CONFLICTS,
Reynolds, Smith and Hills, Jacksonville, Fla.
For primary bibliographic entry see Field 6G.
W76-07153

FLOOD PROTECTION OF CRYSTAL RIVER UNIT 3 NUCLEAR PLANT,
Dames and Moore, Los Angeles, Calif. Ocean Sciences.
R. M. Noble, and B. Simpson.
Journal of the Power Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. PO1, Proceedings paper No. 11458, p 85-94, July 1975. 8 fig, 4 ref.

Descriptors: *Flood protection, *Florida, *Nuclear reactors, *Storm surge, Flood control, Floods, Storms, Evaluation, Hurricanes, Design, Water levels, Waves(Water).
Identifiers: Power.

To satisfy U.S. Atomic Energy Commission (AEC) safety criteria, a required evaluation of the worst site-related flood is performed for the Crystal River Plant, located on the Gulf Coast of Florida, where the probable maximum stillwater flood levels are likely to be a result of the probable maximum hurricane. Flood protection requirements for the Crystal River Plant are determined by considering the most severe combination of probable maximum hurricane parameters for the Gulf Coast Region. These parameters are used as input to a model of hurricane surge generation and attendant wave activity in order to determine the maximum flood levels at the Crystal River Plant. (Bell-Cornell)
W76-07210

NEBRASKA FLOOD-PLAIN MANAGEMENT PROGRAM--PART I,
Nebraska Natural Resources Commission, Lincoln. Flood Plain Management Section.
For primary bibliographic entry see Field 6F.
W76-07215

NEBRASKA FLOOD-PLAIN MANAGEMENT PROGRAM--PART II,
Nebraska Natural Resources Commission, Lincoln.
For primary bibliographic entry see Field 6F.
W76-07216

DETENTION STORAGE CONTROL STRATEGY DEVELOPMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-07236

OPERATIONS MODELS FOR CENTRAL VALLEY PROJECT,
California Univ., Los Angelos. Dept. of Engineering Systems.
L. Becker, W. W-G. Yeh, D. Fults, and D. Sparks.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Proceedings paper No. 12062, Vol. 102, No. WR1, p 101-115, April 1976. 2 fig, 1 tab, 29 ref. OWRT C-5184 (No. 4208) (3).

Descriptors: *Water resources, *Multiple-purpose projects, *Decision making, *Hydro-electric power, *California, *Optimization, Mathematical models, Reservoirs, Planning, Management, Operations research, Algorithms, Water policy, Linear programming, Dynamic programming.
Identifiers: *Central Valley Project(Calif).

System optimizing procedures are being developed for on-line use in the operation of the Central Valley Project in California, a complex multiple objective water resource system. The project is subject to requirements and interagency agreements. A practical optimization method must address not only these requirements but also the continuing needs of day-to-day operation, and the necessity for interposing the project managers in monitoring and final decision roles. The basic technical difficulty with an optimizing algorithm for a complex water resource system is the dimensionality which can easily run into the tens of thousands of decision variables and constraints. The method being developed for the project provides the necessary decomposition and involves the project managers, assisted by an integrated group of multiple policies based on interconnected monthly, daily, and hourly models, using iterated linear programming-dynamic programming techniques. (Bell-Cornell)
W76-07237

PLANTING SHRUBS AND HALF-SHRUBS IN MOISTURE STORING FURROWS, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Institut Botaniki.
K. Faizev.
Uzb Biol Zh. 17(6), p37-39, 1973.

Descriptors: *Moisture content, *Land reclamation, *Soils, *Vegetation.
Identifiers: Aellenia-Subphylla, Artemisia-Turanica, Furrows, Haloxylon-Aphyllum, Kochia-Prostrata, Salsola-Orientalis, Shrubs, *USSR(Red Sand Desert).

Vegetative reclamation of the gray-brown, solonetz and solonchak soils on pastures of southwestern Kyzyl-Kum (Red Sand Desert) USSR, was studied. Moisture-storing furrows were plowed perpendicular to the grade of the relief to collect atmospheric precipitation. Haloxylon aphyllum, Kochia prostrata, Salsola orientalis, Aellenia subphylla, Artemisia turanica were planted in the furrows. Good sprouts and high yield were obtained.--Copyright 1975, Biological Abstracts, Inc.
W76-07288

LOS ANGELES DAM AND RESERVOIR PROJECT SAN FERNANDO VALLEY, LOS ANGELES COUNTY, CALIFORNIA, VOLS. I AND II.
Federal Disaster Assistance Administration.
For primary bibliographic entry see Field 8A.
W76-07357

CRITERIA FOR THE IDENTIFICATION OF AREAS OF ENVIRONMENTAL CONCERN PREPARED FOR NORTH CAROLINA LAND POLICY COUNCIL.
North Carolina Land Policy Council, Raleigh.
For primary bibliographic entry see Field 6E.
W76-07371

ANDRUS V. STATE (NEGLIGENT HIGHWAY CONSTRUCTION WHICH CAUSED FLOOD-WATER DAMAGE TO HOME).
541 P2d 1117-24 (Utah 1975). 8 p.

Descriptors: *Utah, *Judicial decisions, *Negligence, *Road construction, *Flood damage, Legal aspects, Water law, Penalties(Legal), Roads, Highways, Construction, Erosion, State governments, Basins, Runoff, Highway effects.
Identifiers: Sovereign immunity.

Plaintiff homeowners brought an action against defendant State of Utah and the State Highway Department to recover for damage sustained by the plaintiffs' property from flood waters. The plaintiffs contended that the damage was caused by negligent construction of a state highway which allowed quantities of water to collect in a basin created by the construction. These accumulated waters broke through an embankment flooding the plaintiffs' home. A jury found the defendants liable. On appeal the defendants contended that the highway was not negligently constructed, and that even if it was, the state was immune from liability in that highway construction is a discretionary state function. The Utah Supreme Court affirmed the trial court's decision, holding that the issue of the defendants' negligence was a question for the jury. Furthermore, although the decision to build the highway was a discretionary function, the state was not immune from negligence in the planning and supervising of the construction. (Nursey-Florida)
W76-07384

THE EFFECT OF WIND ON GRASSES: I. CUTICULAR AND STOMATAL TRANSPIRATION,
Edinburgh Univ. (Scotland). Dept. of Forestry and Natural Resources.
For primary bibliographic entry see Field 2D.
W76-07425

USE OF THE BULRUSH IN WATER MANAGEMENT, (IN RUSSIAN),
Northern Research Inst. of Hydraulic Engineering and Land Reclamation, Kazan (USSR).
N. N. Karaseva, and V. G. Papchenkov.
Rastit Resur. 10(1), p 138-142, 1974.

Descriptors: Aquatic plants, Vegetation, Salmonella, Water management(Applied), *Self-purification, *Nutrients, Fish, Phenols, E. coli, Industrial wastes.
Identifiers: Bactericidal effects, Bulrush, Minerals, Scirpus-Lacustris.

The use of higher aquatic vegetation for self-purification of bodies of water was studied. The bulrush (Scirpus lacustris): grows well in industrial and domestic waste waters; can extract nutrients (P, K, N, etc.), trace elements (Fe, Mn, Cu, etc.) and various organic substances from the water; can grow in waters with a high concentration of 17 different organic compounds lethal for fish and absorb them completely after certain number of days; can grow in water severely polluted with phenol and extract it from the water; has bactericidal effects on the colon bacillus (Escherichia coli) and Salmonella; and supplies the water with more O2 than other aquatic plants.--Copyright 1975, Biological Abstracts, Inc.
W76-07449

4B. Groundwater Management

MONTANA WATER USE ACT.
For primary bibliographic entry see Field 6E.
W76-06839

EVALUATION PROCEDURE OF CRITICAL FACTORS OF MINING IMPACT ON GROUND WATER RESOURCES,
Moody and Associates, Inc., Meadville. Pa. Environmental Services Div.
For primary bibliographic entry see Field 5G.
W76-06941

THE HYDROLOGY OF AN ACID MINE PROBLEM,
Idaho Univ., Moscow.
For primary bibliographic entry see Field 5G.
W76-06942

GROUND WATER LEACHING OF JIG TAILING DEPOSITS IN THE COEUR D'ALENE DISTRICT OF NORTHERN IDAHO,
Idaho Univ., Moscow.
For primary bibliographic entry see Field 5B.
W76-06951

GROUND-WATER MOVEMENT THROUGH AN ABANDONED TAILINGS PILE,
Idaho Bureau of Mines and Geology, Moscow.
For primary bibliographic entry see Field 5B.
W76-06952

AN INTRODUCTION TO HYDROGEOCHEMICAL EXPLORATION,
P. B. Trost.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 230-236. 3 fig, 2 tab, 10 ref.

Descriptors: *Groundwater, *Water chemistry, *Exploration, *Mineralogy, Chemical analysis, Chemistry, Geochemistry, Hydrogeology, Geology, Sampling, Analysis, Trace elements.
Identifiers: *Hydrogeochemical exploration.

The use of groundwater for geochemical exploration has been utilized in the U.S. and Russia since at least 1950. Targets most commonly sought have included uranium, massive sulfides overlain by glacial material, porphyry copper deposits buried beneath gravels, phosphate deposits, geothermal systems and crude oil and gas. The main advantage is the detection of mineralization which has little or no geologic expression. Samples have been collected from all types of water wells after they have been actively pumping for ten minutes or more. Analytical requirements are quite stringent since most trace elements are present in the parts per billion range. Interpretation is hindered by the lack of sufficient wells for detailed sampling, resulting in large (10-200 sq mi) anomalous areas. The future of groundwater geochemical exploration lies in refinement of the interpretation phase of the program. This must be done through integration of hydrogeological, and geochemical parameters of the groundwater system. So doing would then aid in determining anomalies associated with the desired target versus spurious or displaced anomalies. (See also W76-06938) (Sims-ISWS)
W76-06956

GROUNDWATER YEAR BOOK 1968-70.
Department of the Environment, London (England). Water Data Unit.
For primary bibliographic entry see Field 2F.
W76-07063

A SEISMIC GROUND-WATER SURVEY IN NEW HAMPSHIRE,
New Hampshire Univ., Durham. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2F.
W76-07086

APPLICATION OF GEOCHEMICAL PRINCIPLES, ISOTOPIC METHODOLOGY, AND ARTIFICIAL TRACERS TO KARST HYDROLOGY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-07112

GROUND-WATER LEVELS ON BOSTON PENINSULA, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W76-07119

WATER-LEVEL RECORDS FOR THE SAN LUIS VALLEY OF COLORADO, 1972-76,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-07129

THE USE OF GROUND-WATER RESOURCES IN RIVER BASIN DEVELOPMENT,
Research Inst. for Water Resources Development, Budapest (Hungary).
G. Kovacs.
Working Paper No. 44, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 24 p, 7 fig, 1 tab, (United Nations, Department of Economic and Social Affairs).

Descriptors: *River basin development, *Groundwater resources, *Water resources, Water demand, Hydrology, Economics, Surface waters, Equations.

The reliability of decisions concerning river basin development is influenced strongly by the alternatives considered and compared as equivalent solutions. One of the possible alternatives to meet the water demand is the utilization of groundwater resources. This paper analyzes some aspects of the hydrological and economic studies forming the basis of large-scale groundwater exploitation. Theoretical investigations and practical examples are presented. From these, the following conclusions have been made: (1) the utilization of groundwater resources should be considered as one of the alternative sources to cover water demand, especially in large sedimentary basins; (2) surface water and groundwater resources do not exist separately: they comprise one unit of water resources and their interaction must be investigated; (3) the quality of groundwater is generally suitable for direct human consumption, while surface waters need special treatment in most cases: it is reasonable, therefore, to give priority to urban and rural water supply needs in providing groundwater resources; and (4) the use of the natural storage capacity and artificial recharge of aquifers should be considered as a possible way of equalizing the fluctuation of the available water resources. (Bell-Cornell)
W76-07132

A PLANNING STUDY ON DAIRY WASTES MANAGEMENT,
Webb (Albert A.) Associates, Riverside, Calif.
For primary bibliographic entry see Field 5D.
W76-07175

DAIRY LAGOON SYSTEM AND GROUNDWATER QUALITY,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-07185

EFFECT OF ANAEROBIC SWINE LAGOONS ON GROUNDWATER QUALITY IN HIGH WATER TABLE SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-07190

ON LAND DISPOSAL OF LIQUID ORGANIC WASTES THROUGH CONTINUOUS SUBSURFACE INJECTION,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-07203

STATE-OF-THE-ART OF GEOTHERMAL RESERVOIR ENGINEERING,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
P. K. Takahashi, B. H. Chen, K. I. Mashima, and A. S. Seki.
Journal of the Power Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. PO1, Proceedings paper No. 11455, p 111-126, July 1975. 3 fig, 2 tab, 23 ref.

Descriptors: *Aquifers, *Geothermal studies, *Powerplants, *Hawaii, *Reservoirs, *Wells, Energy, Hydrodynamics, Temperature, Testing, Mathematical models, Equations, Systems analysis, Research, *Reviews.
Identifiers: *Geotechnical engineering, Power, Systems engineering, Geothermy, Water flow.

This paper is a comprehensive survey into the 'state-of-the-art' in geothermal reservoir engineering. While there is general lack of hard quantitative data, rapid progress is beginning to be made in the field. The presentation takes the form of a survey paper and is in six parts: (1) the nature of geothermal reservoir; (2) geothermal reservoir engineering--hardware; (3) geothermal reservoir engineering--measurement and methods of analysis; (4) an international questionnaire; (5) what is geothermal reservoir engineer. and (6) geothermal reservoir engineering: research plan for the Hawaii Geothermal Project. The geothermal reservoir engineering research team is using computer and physical modeling and geothermal well testing/analysis. The computer modeling group hopes to predict the performance of geothermal wells and to study the environmental impact of the geothermal system, especially with respect to the stability of the Ghyben-Herzberg lens. The physical model is needed to balance the ongoing software investigations. (Bell-Cornell)
W76-07209

METHOD FOR DETECTING AND LOCATING WATER-PRODUCING ZONES AND/OR WATER THIEF ZONES IN SUBTERRANEAN FORMATIONS,
Continental Oil Co., Ponca City, Okla. (Assignee).
D. D. Sparlin, W. H. Fertl, and G. C. Young.
U.S. Patent No. 3,940,612, 4 p, 6 ref; Official Gazette of the United States Patent Office, Vol 943, No 4, p 1886, February 24, 1976.

Descriptors: *Patents, *Aquifers, *Water sources, *Groundwater, Geologic formations, Subsurface waters, Water storage, Water yield, Locating, Radioactivity techniques, Wells, Injection wells.

A method for locating water-producing zones and/or water thief zones in a subterranean formation penetrated by a well bore is described. The formation is injected with an aqueous solution containing from about 0.01 to 7.5 weight percent of an irradiated water soluble compound having preferential silica adsorptive characteristics. Radioactivity detection means are passed through the well bore and the measurement of radioactivity is recorded. The reservoir or injection well is returned to normal production or normal water injection. Radioactivity detection means are again passed through the well bore to record the measurement of radioactivity of the formation and the measurements of radioactivity are compared to determine water producing zones and/or water thief zones. (Sinha - OEIS)
W76-07448

4C. Effects On Water Of Man's Non-Water Activities

WILDLIFE, ECOLOGY AND PLANNING IN A PROPOSED IRRIGATION SYSTEM,
North Dakota State Univ., Fargo. Dept. of Zoology.
J. J. Peterka.
North Dakota Water Resources Research Institute, Fargo, Completion Report No. WI-222-011-75, November, 1975, 46 p, 10 fig, 11 tab, 26 ref. OWRT-B-014-NDAK(2), 14-31-0001-3319.

Descriptors: Wildlife habitats, *Land use, Irrigation systems, *North Dakota, *Wildlife management, Ecology, Planning.
Identifiers: *Garrison Diversion(N Dak).

Interrelationships between past and present land use and wildlife population indices were studied to provide a guide for the development of a wildlife management plan for irrigated land. The study centered around a 20,000 acre area in southeastern North Dakota which will be the first area scheduled for irrigation in the Garrison Diversion Project; a total of 250,000 acres will eventually be irrigated under the project in central and eastern North Dakota. In Dickey and Sargent counties indices from 1946 to 1972 for pheasants, jackrabbits, cottontail rabbits, and mourning doves were compared with 16 land use variables by correlation analysis. The only interrelationship that could be satisfactorily explained was between pheasants and soil bank land from 1956 to 1969. Pheasant populations followed the same trends as the total acres of lad retired under the soil bank program. In the three 20,000 acre study areas in Dickey and Sargent counties, from 1970 to 1972, the amount of cultivated land and the availability of undisturbed habitat accounted for most of the variability in the pheasant population within the three study areas. Mourning doves were closely associated with trees and also to a somewhat lesser extent, with idle herbaceous areas. Populations increased between 1970 and 1971, and decreased in 1972, for pheasants, mourning doves, meadowlarks, jackrabbits, striped skunks, red fox and racoons. These population fluctuations were not associated with any land use change or other observable factors.
W76-06804

DESIGN APPROVAL AND ENVIRONMENTAL IMPACT.
Federal Highway Administration, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-06834

WATER RESOURCES PROBLEMS RELATED TO MINING.
American Water Resources, Association, Minneapolis, Minn.
For primary bibliographic entry see Field 5G.
W76-06938

EVALUATION PROCEDURE OF CRITICAL FACTORS OF MINING IMPACT ON GROUND WATER RESOURCES,
Moody and Associates, Inc., Meadville. Pa. Environmental Services Div.
For primary bibliographic entry see Field 5G.
W76-06941

TIMBER HARVEST AS AN AGENT OF FOREST STREAM CHANNEL MODIFICATION,
Forest Service (USDA), Parsons, W. Va. Northeastern Forest Experiment Station.
J. H. Patric.
In: Symposium on Stream Channel Modification Proceedings, August 15-17, 1975, Harrisonburg, Virginia. p. 108-116, (1975) 21 ref.

Descriptors: *Watershed management, Channels, *Channel erosion, Regulation, Roads, Soil erosion, Soil stabilization, Stream erosion, Water resources, Lumbering, Clear-cutting, Applachian mountain region.
Identifiers: *Channel protection, Stream damage, Timber harvest.

Some popular beliefs are contrasted with research results concerning timber harvest as a modifier of forest stream channels. A few commonly used terms are defined but no new research results are presented. Logging in or too close to streams is identified as the major and indefensible cause of most unwanted channel modification. Tree cutting, log skidding, and road building can cause soil erosion and stream sedimentation but these intermittent activities seldom cause major channel modifications. Evidence is accumulating that timber harvest with minimal stream damage can become the rule if loggers observe well-known precautions to protect soil and water resources. (Forest Service)
W76-07017

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: FERNOW EXPERIMENTAL FOREST, W. VIRGINIA,
Forest Service (USDA), Parsons, W. Va. Northeastern Forest Experiment Station.
J. N. Kochenderfer, and G. M. Aubertin.
In: Municipal Watershed Management Symposium Proceedings, USDA Forest Service General Technical Report NE-13, p 14-24, 1975. 5 fig, 2 tab, 10 ref.

Descriptors: *Watershed management, Deciduous forest, Forest management, Hydrology, *Water quality, Water yield, Watershed(Basin), *West Virginia, Water supply.
Identifiers: *Fernow Experimental Forest(W Va), Merchantable timber products.

Results of 22 years of forest hydrology research on the Fernow Experimental Forest are reviewed. Forest influences were measured on quantity and timing of streamflow and on parameters of water quality such as turbidity, temperature, specific conductance, pH, alkalinity, and nutrient concentrations. These results indicate that it is currently not practical to manage forest land for both sustained increased water yield and merchantable timber products, and that forest land can be managed for a variety of uses without impairing water quality if these uses are regulated intelligently. (Forest Service)
W76-07021

FOREST MANAGEMENT AND NUTRIENT CYCLING IN EASTERN HARDWOODS,
Forest Service (USDA), Parsons, W. Va. Northeastern Forest Experiment Station.
J. H. Patric, and D. W. Smith.
Research Paper NE-324, 1975. 12 p, 3 fig, 5 tab, 62 ref.

Descriptors: *Cycling nutrients, *Deciduous forests, *Forest management, *Nitrogen, Rotations, Nutrients, *Reviews, Lumbering, Northeastern US, Southeastern US.
Identifiers: *Literature review, Forest stands, Harvesting wood.

The literature was reviewed for reports on nutrient cycling in the eastern deciduous forest, particularly with respect to nitrogen, and on effects of forest management on the nutrient cycle. The nutrient content of the forest stand is a relatively small part of the total nutrient pool contained in soil. Under present practices of harvesting wood on a 50- to 100-year rotation, nutrient deficiency as a result of crop removal seems unlikely on most forest land. (Forest Service)
W76-07025

EROSIONAL EFFECTS OF WILDFIRE AND LOGGING IN IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-07027

FLOODFLOW CHARACTERISTICS AT BRIDGE SITE ON INTERSTATE HIGHWAY 80, THE GREEN RIVER NEAR GREEN RIVER, WYOMING,
Geological Survey, Cheyenne, Wyo.
G. S. Craig, Jr.
Open-file report 76-237, March 1976. 12 p, 6 fig, 1 plate, 1 ref.

Descriptors: *Flood data, *Flood frequency, *Flood profiles, *Wyoming, Peak discharge, Bridge construction, Reservoirs, Streamflow, Hydrologic data, Mapping, Wyoming.
Identifiers: *Green River(Wyo), 50-year flood.

This report was prepared in 1964, before construction of the Interstate Highway 80 bridge and the Fontenelle Reservoir near Green River, Wyo. Owing to renewed interest in the floodflow characteristics of the river, it was decided in February 1976 to release the report to the open file. During the intervening years, the I-80 bridge was built and the Fontenelle Reservoir was constructed. Except for the addition of metric units, the original text has not changed. The 50-year flood at the bridge centerline was estimated to be 20,100 cfs. Elevation of this flood at the approach section 465 ft upstream from the bridge site is 6,099.3 ft. Annual peaks are most likely to occur in May or June. Fontenelle Reservoir, under construction in 1964, can pass flows much greater than the 50-year flood. Mean velocity in the approach section for the 50-year flood is about 4.2 fps overall and 5.8 fps in the main channel. Such velocities could cause scour, especially just upstream from the right abutment of the I-80 bridge. (Woodard-USGS)
W76-07120

TIMBER MANAGEMENT INFLUENCES ON AQUATIC ECOSYSTEMS AND RECOMMENDATIONS FOR FUTURE RESEARCH,
Pennsylvania State Univ., University Park. School of Forestry.
For primary bibliographic entry see Field 5G.
W76-07151

HYDROBIOLOGICAL OBSERVATIONS ON THE RIVER RIUL DOAMNEI (DISTRICT ARGES), (IN ROMANIAN),
Institutul de Cercetari si Proiectari Aliment., Bucharest (Rumania).
For primary bibliographic entry see Field 5C.
W76-07310

THE TRICHOPTERA OF THE SUNDAYS AND FISH RIVERS, EASTERN CAPE PROVINCE, SOUTH AFRICA,
Albany Museum, Grahamstown (South Africa).
For primary bibliographic entry see Field 5C.
W76-07417

4D. Watershed Protection

COMPARISON OF THE GEORGIA TECH, KANSAS, KENTUCKY, STANFORD AND TVA WATERSHED MODELS IN GEORGIA,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-06806

MUNICIPAL WATERSHED MANAGEMENT SYMPOSIUM PROCEEDINGS.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
Proceedings of Symposium, September 1973, The Pennsylvania State University and the University of New Hampshire, 196 p. USDA Forest Service General Technical Report NE-p,3, 1975. OWRT A-999-PA(4).

Descriptors: *Watershed management, Forest management, *Demonstration watersheds, *Municipal water, Water management(Applied), Water quality, Water reuse, Cities.
Identifiers: *Municipal watersheds.

During the past 30 years, forest-watershed-management research has produced a wealth of information about, water-yield augmentation and water-quality protection. The purpose of this Symposium was to bring together some of the research

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and management information that would be useful to municipal watershed administrators in formulating land-management policies. Increasing population and improved technology have placed new values on the forest and water resources, particularly in highly urbanized regions. Continuing urbanization has increased water demands and has necessitated that watersheds be managed for maximum water production, while at the same time there are mounting public pressures to utilize these areas for recreation.
W76-06812

DECISION ANALYSIS FOR WATERSHED MANAGEMENT ALTERNATIVES,
Arizona Univ., Tucson, School of Renewable Natural Resources.
M. M. Fogel, J. L. Thames, L. Duckstein, and D. R. Davis.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-252 189, $3.50 in paper copy, $2.25 in microfiche. Completion Report, January 1976. 16 p, 27 ref. OWRT B-032-ARIZ(23). 14-31-000-3858.

Descriptors: *Watershed management, *Decision making, *Flood control, *Irrigation, *Water yield, Sediment yield, Optimization, Snowmelt runoff, Land use, *Model studies, *Alternative planning, Time seris analysis, Structural design, Water policy.
Identifiers: *Stochastic analysis, Vegetation management, Bayesian analyses, *Watershed models.

The primary purpose was to develop a methodology for watershed managers to use in resource development and conservation decision making. Stochastic event-based precipitation models were derived to serve as inputs into deterministic watershed models with the result that a time series of hydrologic outputs could be obtained. These outputs, water and sediment yields and peak flow rates, could then be used to reflect the extent of man's activities in modifying the environment, as ell as for the optimal design and operation of water control facilities. The effort was directed for moderate-sized watersheds where little or no streamflow data was available, but precipitation information could be obtained from onsite or nearby locations. A variety of problems were modeled by this approach, such as, predicting snowmelt runoff, modeling hydrologic effects of land use changes, stochastic analyses of water yield increase from vegetation management, and the design of floodwater retarding structures. The project demonstrated that inventory control techniques could be adapted for obtaining an optimal irrigation policy, i.e., one that mixiimizes net returns to farmers. Bayesian decision theory was used in conjunction with event-based precipitation models for obtaining the desin of a structure tailored to a specific problem rather than using a pre-specified criteria such as the 100-year flood.
W76-06905

SHALE CHISELING-EFFECT ON WATER YIELD,
Virginia Polytechnic Inst., and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3B.
W76-06924

CONSIDER THE PLANT IN PLANNING WIND EROSION CONTROL SYSTEMS,
Agricultural Research Service, Big Spring, Tex.
D. W. Fryrear, and J. D. Downes.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 6, p 1070-1072, November-December 1975. 3 tab, 14 ref.

Descriptors: *Wind erosion, *Crops, *Erosion control, Plant growth, Planning, Soils, Winds, Wind pressure, Onions, Carrots, Cotton, Tomatoes, Laboratory tests, Soil moisture, *Great Plains.
Identifiers: *Soil fluxes, *Crop survival, Southern Great Plains, Peppers, Cabbage, Cucumbers, Sandy soils, Southern peas.

Wind erosion on sandy soils in the Southern Great Plains is a problem for thousands of farmers yearly. Eight crops were exposed to windblown sand injury in a laboratory wind tunnel. The relationship between plant survival and exposure conditions was determined. Soil fluxes (windblown sand) were established for 80% survival of the crops tested, which showed that 6-day-old southern peas could withstand a soil flux of 0.8 gm/cm width/sec for 10 min while 6-day-old peppers could withstand an estimated 0.04 gm/cm width/sec. Computed soil fluxes for various field conditions showed that a combination of surface residue and roughness of 2,500 kg cm/ha would reduce soil fluxes to 0.08 gm/cm width/sec, which would be sufficient to protect five of the eight crops from severe injury. A moist soil surface was found to reduce soil flux 50% as compared with a dry soil, but surface moisture for sandy soils was very transient and could not be considered an effective erosion control technique. Surface soil moisture increased clod formation when the soil was cultivated, and the rough soil would reduce erosion potential. (Roberts - ISWS)
W76-06928

TIMBER HARVEST AS AN AGENT OF FOREST STREAM CHANNEL MODIFICATION,
Forest Service (USDA), Parsons, W. Va. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W76-07017

SEDIMENT STORAGE IN CHANNELS DRAINING SMALL FORESTED WATERSHEDS IN THE MOUNTAINS OF CENTRAL IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
W. F. Megahan, and R. A. Nowlin.
In: Proc. 3rd Federal Inter-Agency Sedimentation Conf. 1976. Denver, Colo., Mar. 22-25, 1976. Sedimentation Comm, Water Resources Council, Washington, D.C. p. 4-115 - 4-126, 1976.

Descriptors: *Erosion, *Channel erosion, *Stream erosion, *Sediment yield, Sedimentation, *Aggradation, Deposition degradation, Scour, Streambed, Bank erosion, Obstruction to flow, Continuity equation, Idaho, Channels, Small watersheds, Forest watersheds.
Identifiers: *Idaho Batholith, Granitic soils, Undisturbed watersheds, Aquatic ecology, *Sediment storage.

Considerable effort has been devoted to measuring on-site erosion and downstream sedimentation over the past 40 years. However, the role of sediment storage in channels has been almost entirely overlooked. This study was designed to measure the annual change in sediment stored in seven, undisturbed, tributary streams in the Idaho Batholith. Additional data were collected to evaluate the influence of natural obstructions such as logs, rocks, etc. on sediment storage. Extremely large volumes of sediment were trapped behind obstructions in two sample years; only about 10 percent of the stored sediment appeared as annual sediment yield. Sediment stored in channels on these undisturbed, forested watersheds, changed considerably between a high streamflow versus a low streamflow year. A continuity equation was used to estimate the annual watershed erosion. There is considerable interest in modelling downstream sediment yields in order to provide land managers with a means to meet the needs of recent pollution laws that apply to forest lands. This study illustrates the need to include channel sediment storage as a subsystem in model development. In addition, the data show that the aquatic ecosystem is naturally subjected to much larger variations in sediment deposition than was heretofore suspected. (Forest Service)
W76-07019

SEDIMENTATION IN RELATION TO LOGGING ACTIVITIES IN THE MOUNTAINS OF CENTRAL IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
W. F. Megahan.
In:Present and Prospective Technology for Predicting Sediment Yields and Sources, Proc. Sediment-Yield Workshop, USDA Sediment Lab., Oxford, Miss. November 28-30, 1972 US Agric. Res. Serv. Rep. ARS-S-40, p. 74-82, 1975 5 fig, 4 tab, 16 ref.

Descriptors: Sedimentation, *Sediment yield, *Erosion, *Accelerated erosion, *Road construction, *Organic matter, Anadromous fish, Particle size, Aggradation, Scour, Riverbeds, Fish spawning, Aquatic environment, Idaho, *Lumbering.
Identifiers: *Idaho Batholith, *Granitic soils, Study watersheds, *Organic sediment, *Lithic sediment.

Sedimentation, more than any other single factor, has been a focal point for those concerned with the impacts of land uses in the 16,000-square-mile Idaho Batholith. Annual sediment yields from undisturbed, forested watersheds are presented based upon 82 station years of record from 14 study watersheds. Additional analyses are provided to indicate lithic sediment particle size and organic sediment production from undisturbed watersheds. Data are presented to illustrate effects of logging and road construction on sedimentation. Channel studies in a major salmon spawning stream show how excessive sediment deposition is removed from the channel system over a 5-year period. Such information is very helpful to land managers concerned with obtaining optimum uses of forest lands without undue impacts on water resource values. (Forest Service)
W76-07020

EROSIONAL EFFECTS OF WILDFIRE AND LOGGING IN IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
W. F. Megahan, and D. C. Molitor.
In: Proceedings of Watershed Management Symposium held in Logan, Utah, August 11-13, 1975. American Society of Civil Engineers, New York. p 423-444 (1975) 9 fig, 4 tab, 18 ref.

Descriptors: *Forest fires, *Accelerated erosion, *Vegetation regrowth, Subsurface runoff, Soil wettability, *Sheet erosion, *Rill erosion, Erosion control, Slope protection, Overland flow, Storm runoff, Forest canopy, *Lumbering, *Clear-cutting, *Litter.
Identifiers: *Idaho batholith, Paired watersheds, Fire effects, Water repellent soils, Sediment production, Slash disposal, Intense burning, Coarse-textured soils, Fire ecology, Rilling, Splash erosion, Forest canopy, Erosion pin, Erosion measurement.

Erosion was evaluated on clearcut and unlogged study watersheds that had been subjected to wildfire. Soils found on the study watersheds exhibited the high erodibility characteristics of the granitic soils found in the Idaho Batholith. Erosion data were collected by rill surveys, erosion pins, splash pans, and sediment collection troughs. Additional data to record vegetation responses and soil water repellency were collected using a grid sampling technique. Considerable erosion occurred as the result of overland flow and raindrop splash on the clearcut watershed. There was no evidence of erosion from overland flow on the unlogged watershed, but there was slight splash erosion. Canopy cover effects and litter production from the fire-killed trees were probably an important factor regulating erosion on the unlogged areas. Greater fuel loading and the consequent more intense burn on the clearcut area also probably had an effect by reducing soil surface protection, influencing vegetation responses, and increasing soil water repellency. (Forest Service)

W76-07027

WATER RESOURCES OF THE LAKE OF THE WOODS WATERSHED, NORTH-CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-07115

WATER RESOURCES OF THE CEDAR RIVER WATERSHED, SOUTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-07117

TIMBER MANAGEMENT INFLUENCES ON AQUATIC ECOSYSTEMS AND RECOMMENDATIONS FOR FUTURE RESEARCH,
Pennsylvania State Univ., University Park. School of Forestry.
For primary bibliographic entry see Field 5G.
W76-07151

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

A METHOD FOR MONITORING EUTROPHICATION IN RIVERS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
M. G. Kelly, G. M. Hornberger, and B. J. Cosby.
Completion Report, December 1975. 223 p, 28 fig, 11 tab, 45 ref, 4 append. OWRT C-5333(No. 4231)(1), 14-31-0001-4231.

Descriptors: *Dissolved oxygen, *Eutrophication, *Productivity, Water quality, Aquatic algae, Carbon dioxide, Photosynthrsis, Reaeration, Respiration, Rivers, *Monitoring, *Pollutant identification, Analytical techniques, Measurement, Methodology.
Identifiers: *Net community productivity, *P/R ratio, *Photosynthetic efficiency.

A method for automated in situ measurement of net community productivity was developed. The report describes (1) the method as it may be routinely used as a monitoring technique with completely automated data processing and the new measurement and recording system which was developed to implement the technique, (2) the applicability of the method in eutrophication evaluation in a variety of environments, and (3) a routine procedure for implementation of the method by other potential users. The utility of the technique was demonstrated. Measurements of dissolved oxygen, temperature and solar radiation were used to estimate net community production (P-R), respiration (R), gross production (P), production efficiency and the P:R ratio for six rivers during the summer of 1974. Analysis of these data and comparison with a subjective ranking of the 'eutrophy' of the rivers based on nutrient and chlorophyll data showed that productivity measurements in streams can be used to evaluate eutrophication potential. No single parameter or index proved reliable although the degree of temporal variability of community metabolism was a consistently good indicator of water quality. The analyses suggest that the eutrophication potential of an 'unknown' river can be determined by comparing several weeks of productivity data for summer, low-flow conditions with the data presented here.
W76-06803

COMPARATIVE STUDIES OF SOME INLAND SALINE AQUATIC ECOSYSTEMS IN NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Biology.
M. K. Wali.
North Dakota Water Resources Research Institute, Fargo, Completion Report WI-221-033-76, Part I, January, 1976, 58 p, 19 fig, 15 tab, 61 ref, append. OWRT-A-031-NDAK(1), 14-31-0001-4043.

Descriptors: *Biomass, Chemical analysis, Sediments, *Dissolved oxygen, *Productivity, Temperature, Sago pondweed, *North Dakota, Ecosystems, Lakes, *Lake sediments, Saline water systems, Pollutant identification.
Identifiers: *Potamogetron pectinatus, Macrophytes, *Fox Lake(N Dak), Shallow lakes.

Potamogeton pectinatus L. is a very important wildlife food species, a submerged, marl forming macrophyte and grows as a natural monospecies community in Fox Lake, 16 km northeast of Devils Lake, North Dakota. The water, sediment, dissolved oxygen, temperature and productivity relationships were studied in this small (0.4 x 1.2 km), shallow (60-75 cm) lake. Five replicate samples of the macrophyte, sediment, water and dissolved oxygen were taken at two-week intervals during the 1972 growing season. For comparison, seven P. pectinatus sites in North Dakota, from the Minnesota to the Montana borders, were also sampled. The sediments were analyzed for pH (7.8), electrical conductivity (9.8 Mmhos/cm), organic matter (4.1 percent), particle size (44 percent sand, 31 percent silt, 25 percent clay), 14 cations and four anions. The waters were analyzed for dissolved oxygen at two depths (114 percent saturation at 10 cm and 98 percent saturation at 50 cm), pH (9.2), electrical conductivity (15.8 Mmhos/cm) 13 cations and five anions. The plant biomass (maximum of 293 gm/m2) was determined and samples were analyzed for caloric content (2972 cal/gm), carbon (54.3 percent not corrected for marl), nitrogen (1.47 percent) and 13 cations. The values in parentheses are means for Fox Lake over the 1972 growing season. The temperatures decrease with depth. The dissolved oxygen was higher in the surface waters for all dates, except the earliest sampling periods, when the macrophytes were very short. The ions in the water formed three groups, those in the sediments formed four, and those in the plants formed four groups.
W76-06805

SOME DATA ON COMPARATIVE EVALUATION OF RADIOACTIVE AND CHEMICAL POLLUTION FACTORS IN FRESHWATER RESERVOIRS,
Scientific Research Inst. of Radiation Hygiene, Leningrad (USSR).
For primary bibliographic entry see Field 5B.
W76-06886

SR90 IN THE WATER-ATMOSPHERE INTERFACE,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5B.
W76-06888

SR90 AND CS137 IN SURFACE WATERS OF THE BALTIC, NORTH, IRISH, AND NORWAY SEAS,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliningrad (USSR).
For primary bibliographic entry see Field 5B.
W76-06889

CS137 AND SR90 IN THE SEA OF AZOV,
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5B.
W76-06890

INSTRUMENTAL METHODS OF MONITORING ORGANIC POLLUTION,
Water Pollution Research Lab., Stevenage (England).
R. Briggs, J. W. Schofield, and P. A. Gorton.
Water Pollution Control, Vol. 75, No. 1, p 47-57, 1976. 6 fig, 2 tab, 17 ref, 1 append.

Descriptors: *Organic matter, Monitoring, *Water pollution, *Instrumentation, Analytical techniques, Chemical analysis, Measurement, On-site tests, *Organic wastes, Organic compounds, Water properties, Water pollution sources, Sewage, Water quality, Ultraviolet radiation, Effluents, *Pollutant identification, Respiration, Oxygen demand.
Identifiers: *Monitoring organic pollution, Stevenage Laboratory, Effluent quality, Inorganic carbon, Respiration rate, Ultraviolet light absorption, Organic carbon, Tocsin carbon analyser, Dohrmann DC50 analyzer.

An instrument was described for continuously monitoring organic pollution by ultraviolet light absorption. The instrument readings are reproducible to within + or -5% of full scale, and this can be varied in the range of 5-500 mg/l carbon, depending on the sample path length. The instrument readings are largely independent of the presence of inert suspended matter, but include a significant proportion of the particulate organic matter normally present. The interrelationships between the readings obtained by various methods of analysis were discussed and it was shown that the correlation coefficient obtained from instrument readings versus BOD, COD, and TOC is certainly no worse than that obtained between BOD and COD, TOC and BOD, or TOC and COD, and in most cases was significantly better, probably because of the inherent precision of the method. (Henley - ISWS)
W76-06933

LAKE MICHIGAN WATER QUALITY AND LAKE BED SURVEY, 1973,
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5B.
W76-06937

IMPACT OF ARGO TUNNEL ACID MINE DRAINAGE, CLEAR CREEK COUNTY, COLORADO,
Colorado School of Mines, GoldenDept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
For primary bibliographic entry see Field 5G.
W76-06943

THE APPLICATION OF SPARK SOURCE MASS SPECTROMETRY TO THE ANALYSIS OF WATER SAMPLES,
Accu-Labs Research, Inc., Wheatridge, Colo.
R. Brown, and H. E. Taylor.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 72-84. 6 fig, 6 tab, 6 ref.

Descriptors: *Pollutant identification, *Mass spectrometry, *Analytical techniques, *Instrumentation, *Laboratory tests, Spectrometers, Trace elements, *Water analysis, Water pollution, Water quality, Sediments, Chemical analysis, Mining, Mine water.
Identifiers: *Spark source mass spectrometry.

Spark source mass spectrometry is used routinely in the authors' laboratory to carry out a complete trace element characterization of previously unexamined samples of water. The trace element character of various nominally pure water samples

is very variable depending upon geographic location of the water source. Mass spectrometry may be used in order to carry out a complete characterization in a very short time, for site survey prior to operations and following mining operations. Many of the analytical problems encountered are extremely difficult to solve by other methods. With some ingenuity on the part of the analyst, mass spectrometry has performed well. It is being employed in many areas of analysis pertinent to a study of the environment with equal success. Much information is being produced by the routine analysis of soils, ores, coal, fly ash, oil shale, shale oil, and other fuels. The information yields helps in the correct maximum utilization of fossils fuels with the minimum environmental impact. (See also W76-06938) (Sims - ISWS)
W76-06945

THE RELATION BETWEEN WATER CHEMISTRY AND MINERAL ZONATION IN THE CENTRAL CITY MINING DISTRICT, COLORADO,
Colorado School of Mines, Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
For primary bibliographic entry see Field 5B.
W76-06955

SOME PROBLEMS OF THE INVESTIGATION OF WASTE WATERS GENERATED IN THE PETROLEUM INDUSTRY (KOOLAJIPARI SZENNYVIZEK VIZSGALATANAK NEHANY KERDESE),
E. Hills, L. Vajta, and I. Szerenyi.
Kemiai Kozlemenyek, Vol. 44, No. 1/2, p21-34, 1975.

Descriptors: *Oil industry, *Waste water treatment, *Oil wastes, *Industrial wastes, Phenols, Analytical techniques, *Pollutant identification.
Identifiers: Refinery wastes, Hungary.

Techniques for the analysis of effluents from the petroleum industry were studied. Some of the methods were improved and used for testing the waste waters from Hungarian refineries. Pollutants present in the waste streams of individual refinery units were also identified. Emphasis was placed on the determination of phenols and oil, however, analytical technique were also developed from some particular contaminants, including furfural, acetone, monoethanolamine, and diethylene glycol. The presence of surface active agents in refinery effluents complicates the analyses of such oil contaminated waters. (Takacs-FIRL)
W76-06974

THE USE OF ACTIVABLE TRACERS IN THE EVALUATION OF THE PERFORMANCE OF WASTEWATER TREATMENT PLANTS,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
T. F. Craft, and G. G. Eichholz.
Environmental Letters, Vol. 9, No. 3, p 307-325, 1975.

Descriptors: *Pollutant identification, *Sewage treatment, *Treatment facilities, *Monitoring, *Tracers, *Neutron activation analysis, Analytical techniques, Personnel, Sampling.
Identifiers: Indium, Scandium, *Activable tracers.

Stable, activable tracers have been used to assess operational conditions in waste water treatment plants. A soluble compound containing an element not normally found in the water or wastes is added to the stream. The suitable tracer element must have a high neutron capture cross section, be available at a reasonable cost, and must be nontoxic in the water at the specified concentration. Such tracers may be used to determine flow rates, residence times, flow paths, and recirculation paths in sewage treatment facilities. The sampling procedure is simple enough to be handled by typical plant personnel; neutron activation analysis facilities are also required and analyses are performed by trained laboratory technicians. Indium and scandium salts proved to be satisfactory tracer elements for the procedure. (Kramer-FIRL)
W76-07003

STUDIES ON COLON BACTERIA GROUPS DETERMINATION IN SEWAGE WATER (GESUICHU NO DAICHOKIN GUN SHIKEN NO KENTO),
K. Kozama.
Gesuido Kyokaishi, (Journal of Japan Sewage Works Association), Vol. 12, No. 135, p 38-39, August, 1975. 2 tab, 4 ref.

Descriptors: Analytical techniques, *Bacteria, *Sewage effluents, *Pollution identification, *Waste water treatment, *Laboratory tests, Sampling.
Identifiers: *Colon bacteria.

The number of colon bacteria groups produced from secondary treated sewage effluents was determined in sodium deoxycholate and agar culture media. The one ml sample water was placed on the 10 ml sodium deoxycholate in a Petri dish, to which another 10 ml sodium deoxycholate was added and then mixed. This was cultivated in the agar medium for 18 to 20 hr at 35 to 37 C. Colonies were cultivated and it was determined whether or not generation of gas within fermentation tubes had occurred. If so, the colony in the tube was considered as colon bacteria positive. There were basically three colony types produced. These were colonies sized 1 to 3 mm, 0.5 to 1 mm, and less than 0.5 mm. The tested sample water gave 33 colonies of the first type, 12 of the second type, and 44 of the third type. Of these colonies, the colon bacteria positivity was 73%, 83%, and 7% for the first, second, and third types, respectively. The effect of the amount of sodium deoxycholate for the culture on the generation of colony number was also studied. The use of increased amount of sodium deoxycholate decreased the generation of colon bacteria colonies. (Katayama-FIRL)
W76-07005

VIRUSES IN WATER: THE PROBLEM, SOME SOLUTIONS,
Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidemiology.
C. P. Gerba, C. Wallis, and J. L. Melnick.
Environmental Science and Technology, Vol. 9, No. 12, p 1122-1126, December, 1975. 3 fig, 2 tab, 4 ref.

Descriptors: *Viruses, *Public health, *Water supply, *Potable water, *Sewage treatment, Sewage effluents, Analytical techniques, Water analysis, Water quality standards, Water pollution control, Monitoring, Waste disposal, Water reuse, *Pollutant identification, Laboratory tests.
Identifiers: Enteric viruses.

The public health significance of human pathogenic viruses in water has not yet been determined. Many viruses cause latent or inapparent infections and current epidemiological techniques are not sensitive enough to detect the low-level transmission of viral diseases through water. If domestic waste water is to be recycled in the future, adequate methods must be developed to ensure the elimination of enteric viruses from reclaimed water. Studies have demonstrated that these viruses survive present sewage treatment methods. Concern has also been expressed about the release of viruses into the marine environment through sewage outfalls and polluted rivers. A need exists for better equipped laboratories to perform virological surveys of drinking water supplies. Virus monitoring techniques have been developed for quantifying viruses in shellfish and in landfill leachates. The American Public Health Organization and the World Health Organization have strongly urged that provisional methods for determining viral concentrations in water be identified and that new virus standards be adopted for both potable and nonpotable waters. (Kramer-FIRL)
W76-07006

STUDIES ON CHARACTERISTICS OF THE SURFACE WATER QUALITY IN KAMEDA DISTRICT,
S. Misawa, M. Suzuki, and A. Kaneko.
Niigata Norin Kenkyu, (Niigata Agricultural Science), No. 27, p 27-36, March, 1975. 7 fig, 8 tab, 5 ref.

Descriptors: *Water quality control, *Municipal water, *Water treatment, Surface waters, Sewerage, Drainage, Treatment facilities, Dissolved oxygen, Pollution identification.
Identifiers: *Japan.

An investigation of water quality was performed from 1969 to 1973 at Kameda township in the suburbs of Niigata city, Japan. The average electric conductivity of the municipal water at three main water treatment plants were 66.7, 73.8, and 103.2 micro ohm/cm. The average dissolved oxygen was found to be 8.9, 8.4, and 8.2 ppm. The chloride, sodium, potassium, calcium, and magnesium concentrations ranged from 6.5 to 12.4 ppm, 5.9 to 8.9 ppm, 1.5 to 1.8 ppm, 5.9 to 10.5 ppm, and 2.1 to 3.8 ppm, respectively. Sewerage water at 12 drainages during drought season was also analyzed for electric conductivity and for ion concentrations of Cl, Na, K, Ca, and Mg. (Su-FIRL)
W76-07007

CONTINUOUS DETERMINATION OF TOC AND TOD (TOC, TOD NO RENZOKU SOKUTEI),
S. Kajiyama.
PPM, No. 9, p 32-39, September, 1975. 2 fig, 4 tab, 16 ref.

Descriptors: *Monitoring, *Analytical techniques, *Pollutant identification, *Organic compounds, Water analysis, Absorption, Water quality, Water pollution control.
Identifiers: *Total Organic Carbon(TOC).

Continuous monitoring methods for total organic carbon and total oxygen demand (TOC and TOD) were discussed. The continuous TOC measurement is made by introducing sample water into a catalytic combustion tube and generating carbon dioxide gas which is measured by NDIR. The measured CO2 absorption is the total carbon content in water; therefore, the inorganic carbon contribution must be subtracted from the measured TC to give TOC. This is done by treating the sample water with phosphoric acid and ammonium persulfate in a catalytic tube at 150 C. The generated CO2 gas may then be attributed to inorganic carbon. TOD is measured by generating gaseous compounds from the sample water ina catalytic tube at 900 C and reacting the generated gases with oxygen. After the reaction, the unreacted oxygen concentration is measured by an oxygen detector such as a Pt-Pb liquid fuel cell. The determination error is caused by the dissolved oxygen in the sample water, the presence of inorganic compounds having the capability of liberating oxygen, and the uncertainity in oxidation efficiencies of different compounds. In both TOC and TOD measurements, the correlation between analytical instruments by different manufactures with the analytical values is very poor and calibration methods differ. (Katayama-FIRL)
W76-07010

STREAMFLOW CHEMISTRY AND NUTRIENT YIELDS FROM UPLAND PEATLAND WATERSHEDS IN MINNESOTA,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2K.
W76-07022

SPECIFIC CONDUCTANCE IDENTIFIES PERCHED AND GROUND WATER LAKES,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2H.
W76-07023

HYDROCHEMICAL REGIME AND CHEMICAL COMPOSITION OF OLIGOTROPHIC BOG WATERS,
For primary bibliographic entry see Field 5B.
W76-07079

DEVELOPMENT OF AN OIL-WATER POLLUTION MONITORING SYSTEM,
Naval Postgraduate School, Monterey, Calif.
B. D. Tyler.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD/A-012 460 $5.00 in paper copy, $2.25 in microfiche. Master's Thesis, June 1975. 89 p, 29 fig, 8 tab, 8 ref, 4 append.

Descriptors: *Oil pollution, *Oil wastes, *Monitoring, *Pollutant identification, *Oil, Analytical techniques, Water pollution sources, Water pollution control, Water quality, Fuels, Oily water, Waste water disposal, Oil spills, Carbon, Measurement, Instrumentation, Oceans, Chemical analysis.
Identifiers: *Bilge wastes, Ballast water, Total organic carbon, Beckman Model 915, Mineral analysis, Inorganic carbon.

The prototype of an automatic oil pollution monitor was built and tested. In the system developed, a direct difference method of total organic carbon determination was utilized to ascertain oil concentrations. Using this monitor, it was possible to specify the concentration of any oil, independent of type, in a known water sample. In the final phases of the study, preliminary investigations on prototype improvements and oil concentration determinations in bilge water were initiated. (Henley - ISWS)
W76-07092

SEDIMENTATION RATES AND MEAN RESIDENCE TIMES OF STABLE PB AND 210PB IN LAKE WASHINGTON, PUGET SOUND ESTUARIES AND A COASTAL REGION,
Washington Univ., Seattle. Coll. of Fisheries; and Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 5B.
W76-07093

EFFECT OF ANAEROBIC CONDITIONS IN BOTTOM WATERS ON THE OCCURRENCE OF RED TIDES AT OMURA BAY,
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W76-07101

AVAILABILITY OF GROUND WATER IN THE UPPER CONNECTICUT RIVER BASIN, NORTHERN NEW HAMPSHIRE,
Geological Survey Concord, N. H.
For primary bibliographic entry see Field 7C.
W76-07114

WATER RESOURCES OF THE LAKE OF THE WOODS WATERSHED, NORTH-CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-07115

WATER RESOURCES OF THE CEDAR RIVER WATERSHED, SOUTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-07117

WATER RESOURCES OF THE RIVER RAISIN BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C.
W76-07118

NUTRIENT CONCENTRATIONS OF SURFACE WATERS IN SOUTHERN FLORIDA, SEPTEMBER 1970 TO APRIL 1975,
Geological Survey, Tallahassee, Fla.
W. L. Miller.
Open-file report FL 75010, 1975. 44 p, 32 fig, 8 ref.

Descriptors: *Water quality, *Water analysis, *Nutrients, *Surface waters, *Florida, Nitrogen compounds, Phosphorus compounds, Basic data collections, Sampling, Rivers, Lakes, Canals, Bays, Marshes, Swamps.
Identifiers: Southern Florida.

Inorganic nitrogen and phosphorus in the surface waters of southern Florida were measured by the U.S. Geological Survey during wet (June - October) and dry (November - May) seasons nine times between September 1970 and April 1975. The number of sites sampled ranged from 175 in 1970 to 500 in 1975, with a total of 2,367 samples collected and analyzed. Samples were collected from canals, rivers, lakes, coastal bays, marshes, and swamps. The locations of sampling sites and the nutrient concentrations are shown on maps. (Woodard-USGS)
W76-07126

INDEX OF SURFACE WATER STATIONS IN TEXAS, JANUARY 1976.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-07127

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1976.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-07128

STATISTICAL STUDY OF PHOSPHORUS REMOVAL IN WISCONSIN,
Wisconsin Univ., Madison.
M. H. David, F. J. Schroeder, J. J. Peirce, E. F. Joeres, and D. A. Braasch.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE2, Proceedings paper No. 12045, p 433-447, April 1976. 1 fig, 6 tab, 7 ref.

Descriptors: *Water quality, *Wisconsin, *Environmental engineering, *Sewage treatment, *Statistical methods, *Phosphorus compounds, Planning, Water policy, Polymers, Mathematical models, Design, Systems analysis, Waste water treatment, *Lake Michigan.
Identifiers: Alums.

A statistical study of water quality in the Wisconsin sector of the Lake Michigan watershed revealed that Wisconsin phosphorus removal policy has been only partially effective. A variance components model was applied to water quality data for a sample of 12 municipal treatment plants to test a variety of hypotheses pertaining to phosphorus removal methods and secondary effects on other plant variables. Towns treating with iron compounds achieved significant phosphorus reduction; towns treating with alum did not, possibly because of insufficient alum dosages or incorrect dosing methods. No desirable secondary effects, such as reduction of BOD or suspended solids concentrations, were evident. (Bell-Cornell)
W76-07146

DEVELOPMENT OF WATER QUALITY MANAGEMENT INDICES,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 5G.
W76-07152

PROPERTIES OF SOLIDS AND LIQUIDS FROM STACKED MANURE,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
J. C. Converse, C. O. Cramer, G. H. Tenpas, and D. A. Schlough.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes--1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 432-436.

Descriptors: *Solid wastes, *Liquid wastes, *Separation techniques, *Waste storage, Chemical properties, Physical properties, Land application, *Farm wastes, Ponds, Farm lagoons, Waste treatment, Pollutant identification.
Identifiers: *Manure stacking, Detention ponds, Fly control.

Over winter storage of manure is receiving much emphasis because of concern for environmental quality and desire of the livestock operator to reduce drudgery of daily hauling. Stacking manure is most appropriate for stanchion type dairy facilities. Three years of data from three different stacking systems are summarized. The three systems include a covered bunker type storage for 32 cows, a platform type storage with swinging slide elevator for 28 cows and a platform type storage with a manure blower for 26 cows. Separation of liquids from solids was used in all three systems using drains and porous media. Liquids were stored in a detention pond for later application to crop land. Stacking was done year around with removal during spring and fall. Each system was evaluated for both winter and summer periods for solid and liquid volumes, physical and chemical characteristics of solids and liquids, stackability of manure and fly problems. Liquid runoff from stacks has high pollution potential and must be kept out of bodies of water. Liquid volumes varied with rainfall, amount of manure in storage and ability of liquid to separate from solids. A porous media is required between the manure and concrete floor of storage unit. Solid storage volume requirements were about 1.6 cu.ft./1000 lb. of live weight. Chemical fly control is ineffective and uneconomical for summertime stacking, but biological fly control is effective and economical. Stackability is dependent upon quantity of straw used and time of year stored, with wintertime stacking superior to summertime stacking. (See also W76-07154) (East Central)
W76-07197

GAS CHROMATOGRAPHIC ANALYSIS OF HERBICIDES OF THE CARBOXYLIC ACID ANILIDE GROUP, (IN RUSSIAN),
Vsespuuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
D. B. Girenko, and M. A. Klisendo.
Gig Sanit 11, p 59-61, 1974.

Descriptors: *Gas chromatography, *Herbicides, *Pollutant identification, Analytical techniques, Acids, Organic acids.
Identifiers: *Carboxylic acid anilide group, Solan, Stam.

The gas chromatography method was used for analyzing residues of the herbicides stam, solan and dicryl in air and water. The optimal conditions of chromatography were established and the effectiveness of the column used was determined. Ether or n-hexane can be used as the solvent for extracting the preparations.--Copyright 1975, Biological Abstracts, Inc.
W76-07224

ANALYSIS OF ORGANIC COMPOUNDS IN TWO KRAFT MILL WASTEWATERS,
Southeast Environmental Research Lab., Athens, Ga.
L. H. Keith.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 046, $7.00 in paper copy, $2.25 in microfiche. Report EPA-660/4-75-005, June 1975, 99 p, 45 fig, 7 tab, 42 ref, 2 append. 1BA027.

Descriptors: *Pollutant identification, Phenols, Mass spectrometry, *Pulp wastes, Gas chromatography, *Organic compounds, Water pollution sources.
Identifiers: *Paper mill pollution, Infrared spectroscopy, Fatty acids, Resin acids.

Wastewaters from two kraft paper mills in Georgia were sampled at various points in the waste treatment systems. Gas chromatography of the organic extracts and identification of many of the specific chemical components by gas chromatography-mass spectrometry provided a 'chemical profile' of the effluents. The mills, in different geographical locations, have very similar raw wastewater compositions but different wastewater treatments. In spite of these differences, the treated effluents are qualitatively similar in composition although the quantities of the various components differ. After two years the raw and treated effluents of both mills were re-sampled. Analyses showed that although concentrations of the organics varied, the same compounds are still present. (EPA)
W76-07245

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON VINYL CHLORIDE AND POLYVINYL CHLORIDE.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Research and Development.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-249 461, $5.50 in paper copy, $2.25 in microfiche. Report EPA-600/6-75-004, December 1975. 115 p, 2 fig, 55 tab, 131 ref. 1AA001.

Descriptors: *Chlorides, Environmental effects, Public health, *Human diseases, Toxicology, *Pollutant identification, *Air pollution effects, *Path of pollutants.
Identifiers: Environmental pollution, Environmental distribution, *Vinyl chloride, *Polyvinyl chloride, Carcinogens, Angiosarcoma.

Vinyl chloride (VC) is a chemical of widespread industrial and commercial use. Occupational experience and experimental evidence strongly indicate that it is a carcinogen. Additionally, experimental evidence indicates that it may be a teratogen and mutagen. An increased incidence of liver angiosarcoma, excessive liver damage, and acroosteolysis has been reported among VC workers, and the frequency and severity of the liver pathology is related to the length of exposure. The principal route of exposure is thought to be air inhalation. Sources of increased importance for the general population include food and water. Tumors at multiple and diverse sites have been observed in all species of experimental animals tested for carcinogenicity by inhalation and ingestion of VC. An excess incidence of liver angiosarcoma was observed among VC/PVC (polyvinyl chloride) workers and reproduced in experimental animals with very similar pathology. Liver angiosarcoma was observed in two species of exprimental animals after inhalation exposures of VC at the lowest dose tested, 50 ppm (128,000 micro gram/m3), and after ingestion at 16 mg/kg. In addition to the health effects of VC, sources, distribution, and control technology are discussed. Emissions of VC from VC/PVC plants are estimated to exceed 100 million kilograms annually, about 90 percent of which is from PVC plants. Installation of currently available controls may be adequate to reduce VC emissions from VC/PVC plants in the order of 90 percent. (EPA)
W76-07249

WATER CLARITY RECORDS FROM TWENTY-TWO NEW ZEALAND LAKES,
New Zealand Oceanographic Inst., Wellington.
For primary bibliographic entry see Field 2H.
W76-07253

RELATIVE IMPORTANCE OF SINGLE ALGAE SPECIES IN PLANKTONIC PRIMARY PRODUCTION, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 5C.
W76-07263

WATER TREATMENT IN SQUID PROCESSING WASTES: I. WASTE WATER QUALITY, (IN JAPANESE),
Hokkaido Univ., Sapporo (Japan).
T. Motohiro, and S. Sugiura.
Bull Fac Fish Hokkaido Univ. 24(1), p 49-52, 1973.

Descriptors: *Pollutant identification, *Waste water treatment, Water quality, Nitrogen, Oxygen, Biochemical oxygen demand, Chemical oxygen demand, Chemical analysis.
Identifiers: *Japan(Hakodate), *Squid processing wastes.

A chemical analysis was made on the waste water collected at 6 squid processing plants in Hakodate (Japan) in order to obtain data on waste water quality for water treatment. The waste water contained soluble proteins and meat particles of which the BOD (biological oxygen demand) load was within the range from 70 ppm-12,000 ppm. The COD (chemical oxygen demand) load responded to 1/3-1/4 of the BOD load. Small contents of volatile basic nitrogen and volatile acids were measured in the sample water. The pH values varied from 6.1-7.0, depending on the pollutant levels.--Copyright 1974, Biological Abstracts, Inc.
W76-07266

DIRECT DETECTION OF PATHOGENS OF INTESTINAL INFECTIONS IN WATER, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
G. A. Bagdasar'yan, Y. G. Talaeva, and E. L. Lovtsevich.
Gig Sanit. 2, p 74-76, 1974.

Descriptors: *Pollutant identification, Bacteria, Viruses, Analytical techniques, Epidemiology, Pathogenic bacteria, Infection, Human diseases, Salmonella.
Identifiers: Coxsackievirus, Intestinal infection, Picornaviruses, Shigella.

Methods for the direct detection of intestinal pathogens (bacteria and viruses) in water are described. The need for evaluation of the epidemic safety of surface waters, in swimming pools and wastewaters is emphasized.--Copyright 1975, Biological Abstracts, Inc.
W76-07274

ASSESSMENT OF WATER POLLUTION OF THE DANUBE RIVER IN THE BULGARIAN SECTION (845-375 RIVER KM) ACCORDING TO INDICES OF THE OXYGEN REGIME, (IN GERMAN),
Bulgarian Academy of Sciences, Sofia. Inst. of Hydrology and Meteorology.
For primary bibliographic entry see Field 5B.
W76-07292

HEAVY METAL CONTENT IN THE SEDIMENTS OF THE SOUTHERN PART OF THE COEUR D'ALENE LAKE,
Idaho Univ., Moscow. Dept. of Chemistry.
For primary bibliographic entry see Field 2H.
W76-07394

INVESTIGATION OF TRONDHEIM FJORD: ORIENTATION TO PLANNING AND PRELIMINARY RESULTS, (IN NORWEGIAN),
Norges Tekniske Vitsenskapsakademi, Trondheim.
E. Lande.
Fauna (Oslo). 27(3), p 149-154, 1974.

Descriptors: Fjords, Europe, Measurement, Nitrogen, *Phosphorus, Sampling, Heavy metals, Phytoplankton, Zooplankton, Bottom sampling.
Identifiers: *Norway(Troudheim Fjord).

Hydrographic measurements, nitrogen and phosphorus analysis of the sea water and fresh water from rivers discharging into the fjord, current measurements, phytoplankton and zooplankton sampling, quantitative and qualitative bottom fauna sampling, and heavy metal investigations were done at Trondheim Fjorden, Norway, since 1972. Some preliminary results are discussed. The studies will be completed in 1975.--Copyright 1975, Biological Abstracts, Inc.
W76-07405

BASIC FEATURES OF THE CHEMICAL COMPOSITION OF ORGANIC MATTER IN SEDIMENTS OF MARINE AND OCEANIC BASINS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
O. K. Bordovskii.
Okeanologiya. 14(3), p 448-456, 1974.

Descriptors: *Organic matter, *Sediments, *Oceans, Lakes, Indian Ocean, Pacific Ocean, Antarctic Ocean, Chemical degradation, Plankton.
Identifiers: Bering Sea, Black Sea, Caspian Sea.

Studies were made of the group composition of organic matter in recent sediments of the Caspian, Black and Bering seas, the Eastern Antarctic, the northern part of the Indian Ocean and the Central Pacific, as well as the composition of plankton and corals as the major sources of organic matter. The investigations have shown that organic matter of recent marine and oceanic sediments belongs principally to the same group of matter as dispersed organic matter of fossil sedimentary rocks. The sedimentogenetic stage is characterized by the appearance of some new forms of organic matter - naphthene and aromatic hydrocarbons, asphaltenes, humic acids, insoluble matter, etc. All these components have their analogues in organic matter of fossil rocks and are lacking in the parent living matter. The changes of organic matter to the biostagnant state are accompanied by an accumulation of the cyclic structure of C.--Copyright 1975, Biological Abstracts, Inc.
W76-07407

THE USE OF ION EXCHANGE METHODS FOR THE DETERMINATION OF TRACE ELEMENTS IN NATURAL WATERS-I: COBALT, (IN GERMAN),
Vienna Univ. (Austria). Analytisches Institut.
For primary bibliographic entry see Field 2K.
W76-07408

THE USE OF ION EXCHANGE METHODS FOR THE DETERMINATION OF TRACE ELEMENTS IN NATURAL WATERS-II: CADMIUM, (IN GERMAN),
Vienna Univ. (Austria). Analytisches Institut.
For primary bibliographic entry see Field 2K.
W76-07409

APPLICATION OF ION EXCHANGE METHODS FOR THE DETERMINATION OF TRACE ELE-

MENTS IN NATURAL WATERS-III: THORIUM, (IN GERMAN),
Vienna Univ. (Austria). Analytisches Institut.
For primary bibliographic entry see Field 2K.
W76-07410

THE DIRECT TITRATION OF WATER-SOLUBLE SULFIDE IN ESTUARINE MUDS OF MONTSWEAG BAY, MAINE,
Maine Univ., Walpole. Dept. of Oceanography.
E. J. Green, and D. Schnitker.
Mar Chem. 2(2), p 111-124, 1974.

Descriptors: *Maine, *Volumetric analysis, *Pollutant identification, Mud, *Sulfides, Estuaries, Bays, Dredging, Hydrogen sulfide, Dissolved solids, Sediments.
Identifiers: Anoxic conditions, *Montsweag Bay(Maine).

The use of an antioxidant buffer allows potentiometric titrations of dissolved sulfide, providing Cd or Pb rather than Ag is used as titrant. The method yields a measure of water-soluble as contrasted with acid-soluble sulfide. The vertical distribution of water-soluble sulfide was determined in 8 sediment cores from Montsweag Bay, Maine. Concentration profiles are characterized by 1 or 2 distinct maxima near the surface at depths ranging from 30 cm in areas of slow sedimentation, to 120 cm in areas of rapid sediment accumulation. Concentrations of sulfide at the maxima range from 1-8 mol S/m3 of in situ mud, or from 0.6-4 mmol S/l of pore water. The sulfide-rich upper portion of the mud is poorly consolidated and custardy in texture. Since they may be resuspended during proposed channel modifications, the oxidative demand of these sediments arising from their hydrogen sulfide content alone should be known. Using a conservative estimated mean of 5 mol sulfide/m3-mud, a mixing ratio of less than 30 volumes of O2 saturated seawater per volume of mud will render the water anoxic.--Copyright 1975, Biological Abstracts, Inc.
W76-07415

IMPROVED METHODS FOR THE MEASUREMENT OF DISSOLVED AND PARTICULATE ORGANIC CARBON IN FRESH WATER AND THEIR APPLICATION TO CHALK STREAMS,
Freshwater Biological Association, Wareham (England). River Lab.
C. D. Baker, P. D. Bartlett, I. S. Farr, and G. I. Williams.
Freshwater Biol. 4(5), p 467-482, 1974.

Descriptors: *Freshwater, *Analytical techniques, *Measurement, *Pollutants, *Carbon, Granules, Rivers, Organic matter, Pollutant identification.
Identifiers: Chalk streams, *Organic carbon ,Particulates, Heathland.

The development and use of an improved automatic system for the accurate measurement of dissolved organic carbon (D.O.C.) in fresh water is described. The method, which covers the range 0-25 mg l-1 D.O.C., is based on the oxidation of organic C to CO2 by UV radiation. The carbon dioxide produced is measured by a non-dispersive IR gas analyzer (I.R.G.A.). The I.R.G.A., is also used in the semi-automatic measurement of particulate organic carbon (P.O.C.) by a combustion method which allows very low concentrations to be measured using samples of 200 ml or less. Results of surveys of 2 river systems indicate that D.O.C. concentration of less than 2.0 mg l-1 are typical in unpolluted chalk streams D.O.C. concentrations of streams draining acid heathland were significantly higher (3-5.5 mg l-1). D.O.C. concentration was found to increase rapidly during a spate, in a river draining aread of mixed underlying geology. The throughput of D.O.C. during the 25-50 spates which occur annually in the river could amount to 20-30% of the annual flux of D.O.C.--Copyright 1975, Biological Abstracts, Inc.
W76-07428

EXPERIMENTAL CHARACTERIZATION OF LACUSTRINE CHLOROPHYLL DIAGENESIS: II. BACTERIAL, VIRAL AND HERBIVORE GRAZING EFFECTS,
North Carolina State Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-07431

5B. Sources Of Pollution

EXPERIMENTAL STUDIES OF WING-WALL MIXING CONTROL,
Illinois Univ. at Urbana-Champaign. Dept. of Civel Engineering.
W. H. C. Maxwell, and M. Demissie.
Illinois Water Resources Center, Urbana, Research Report No. 110, February 1976. 71 p, 45 fig, 6 tab, 11 ref. OWRT B-083-ILL(1) 14-31-0001-4079.

Descriptors: *Control structures, *Diffusion, *Mixing, *Outlet works, *Thermal pollution, *Waste dilution, Discharge(Water), Heated water, Outlets, Pollution abatement, Jets, Mixing, Flow control, Flow rates.

Detailed velocity traverses are presented for shallow submerged slot jets without lateral confinement. With wing-walls in place maximum velocities and temperatures were traced for both unheated and heated discharges. These tests were repeated for various wing-wall crest elevations and wing-wall lengths. For the wing-wall tests a typical Reynolds number based on slot width was 400,000 and a typical densimetric Froude number based on slot width was 40. Some flow combinations were unstable and tests were conducted to delineate the limits of stability. The tests demonstrate that flow patterns may be controlled using controlled flow over wing-wall crests. A simple design procedure making use of the data is illustrated.
W76-06814

RADIOECOLOGY OF WATER ORGANISMS, VOL. 2. DISTRIBUTION AND MIGRATION OF RADIONUCLIDES IN FRESHWATER AND SEAWATER BIOCENOSES.
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
Available from the National Techical Information Service, Springfield, Va 22161 as AEC-tr-7606, $7.75 in paper copy, $2.25 in microfiche. Translated from Radioekologiya Vodnykh Organizmov. Vol. 2. Raspredelenie I Migratsiya Radionuklidov V Presnovodnykh I Morskikh Biotsenozakh, 1973. Held at Riga, Apm 18-20, 1972. 182 p. Chief Editor, Andrushaitis, G. P.

Descriptors: *Radioecology, *Radioisotopes, *Water pollution sources, Freshwater, Sea water, Fish, Algae, Migration, Distribution, *Path of pollutants, Lakes.
Identifiers: Accumulation coefficients.

This collection reflects radioecological studies on the accumulation of Sr90 in lakes of different trophic conditions. Achievements and directions in the field are described. Behavior of radionuclides in landscapes surrounding water reservoirs and their migration in rivers and lakes; the fate of radionuclides entering freshwater reservoirs; their accumulation and that of their nonisotopic carriers by hydrobionts; and migration and distribution of emitters among water, soil and biomasses are included. Other articles include the problems of the mechanisms and routes of entry of radionuclides into organisms. (See W76-06862 thru W76-06903) (Chilton-ORNL)
W76-06861

ACHIEVEMENTS AND SOME URGENT PROBLEMS OF WATER RADIOECOLOGY,
Scientific Council on Radiobiology, Moscow (USSR).
R. M. Aleksakhin.
In: Radioecology of Water Organisms. Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 2-9, 35 ref.

Descriptors: *Radioecology, *Radioactivity effects, Migration, Radioisotopes, Radiation, Effects, Aquatic life.

This introductory article of a collection describes the achievements in water radioecology and maps out the desirable and necessary directions for further development of this science in connection with peaceful uses of atomic energy. The migration of radionuclides within individual hydrobiocenoses and in the hydrosphere as a whole, and the effects of ionizing radiation on hydrobionts are discussed. (See also W76-06861) (Chilton-ORNL)
W76-06862

MIGRATION ABILITY OF RADIONUCLIDES AND THEIR TRANSITION INTO WATER WHEN USING ATOMIC ENERGY FOR PEACEFUL PURPOSES,
Institut Prikladnoi Geofizike, Leningrad, (USSR).
F. Y. Rovinskii, G. K. Morozova, E. D. Sinitsina, and N. M. Sinitsin.
IN: Radioecology of Water Organisms Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 10-15, 2 fig, 1 tab, 6 ref.

Descriptors: *Radioecology, *Radioisotopes, *Migration, Radiation, Radioactivity effects, Reservoirs, *Path of pollutants.

Some aspects of the influence of products from underground nuclear explosions on water biocenoses are discussed. Particular areas presented are the transition of radio-nuclides into water systems, the migration ability of radionuclides, the penetration of radionuclides into water reservoirs and radioactive surface runoff, and the entry of radionuclides into water reservoirs situated either directly in the explosion crater or adjacent to the ejected soil containing radioactive substances. (See also W76-06861) (Chilton-ORNL)
W76-06863

ON SR90 MIGRATION IN LAND FRESH WATER,
Institute of Experimental Meteorology, Moscow (USSR).
T. I. Bobovnikova, and K. P. Makhon'ko.
In: Radioecology of Water Organisms. Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 16-19, 1 fig, 2 tab, 4 ref.

Descriptors: *Radioecology, *Migration, *Strontium, Radioisotopes, Distribution, Runoff, Leaching, Freshwater, *Path of pollutants.

Radionuclides deposited on the surface of the land migrate either into the soil or with surface water runoff and their amount depends on the amount of atmospheric precipitation. For Sr90, this relationship is determined by a formula based on the disturbance of Cs137/Sr90 ratio in the soil. The parallel processes of sorption and desorption which bring about equilibrium between the concentrations of nuclides in the water and in the surface layer of the bottom sediments is considered. Results of the measurement of vertical distribution of Sr90 in bottom sediments in rivers is presented. A formula is given for calculating the amount of Sr90 washed out of the soil and carried away in one year. (See also W76-06861) (Chilton-ORNL)
W76-06864

EFFECTS OF SOME NATURAL FACTORS ON THE TRANSITION OF SR90 FROM THE SOIL COVER TO SURFACE WATERS,
Institut Prikladnoi Geofiziki, Leningrad (USSR).
V. V. Pisarev, and I. S. Tsybizov.
In: Radioecology of Water Organisms. Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 20-24, 2 figs, 1 tab, 3 ref.

Descriptors: *Radioecology, *Strontium, *Migration, Soil water movement, Soil contamination, Radioisotopes, Effects, Runoff, Leaching, *Path of pollutants.

The purpose of this work was to study the effects of a number of natural factors, such as the age and level of soil contamination and the depth of water formations (local accumulation of rain water and snow melt water), as well as the length of intervals during successive washing of soils imitating surface flow of Sr90, on the amount of Sr90 migrating from the soil into surface waters. The experiments were conducted on experimental virgin soil areas on the surface of which Sr90 was deposited over a period of approximately ten years. The studies indicated that the age of soil contamination does not affect the transition of Sr90 into surface waters. A sharp decrease in the concentration of Sr90 was seen in a time period corresponding to a runoff of 300 liters of surface water. Sr90 concentration in shallow water formations did not depend on their depths. (See also W76-06861) (Chilton-ORNL)
W76-06865

RADIOACTIVE ISOTOPES IN THE SYSTEM WATER--FRESHWATER PLANTS,
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
N. V. Kulikov.
In: Radioecology of Water Organism. Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p25-31, 44 ref.

Descriptors: *Radioecology, *Aquatic plants, *Freshwater, Radioactivity effects, Strontium, Trophic levels, Reservoirs, Radioisotopes.
Identifiers: *Accumulation coefficients.

A review of studies on the accumulation of radioactive elements by freshwater plants is given. Comparative studies were done on the accumulation of Co, Zn, Zr, Nb, and Ru radionuclides by freshwater plants in reservoirs with running and still water. The obtained data indicated that the accumulation coefficients of radionuclides in plants in reservoirs with running water reach smaller values than in plants in a still water system. It was established that the accumulation coefficients of radionuclides in plants growing in a dystrophic water body was noticeably higher than in an oligomesotrophic water body. (See also W76-06861) (Chilton-ORNL)
W76-06866

SR90 IN WATER, BOTTOM, AND WATER ORGANISMS IN LATVIAN LAKES OF VARIOUS TYPES,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
Y. Y. Sloka, Z. K. Kalninya, D. R. Vadzis, and M. P. Leinerte.
In: Radioecology of Water Organisms, 1973. Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Bioceneses, p 32-34, 3 ref.

Descriptors: *Radioecology, *Radioactivity effects, *Strontium, *Trophic levels, Aquatic life, Bottom sediments, Plankton, Benthos, Migration, *Path of pollutants, Lake sediments.
Identifiers: *Accumulation coefficients.

Accumulation of Sr90 and stable Sr in water, bottom soils, and hydrobionts of three lakes were compared. Accumulation coefficients of Sr90 in the plankton of the mesotrophic and eutrophic lakes were both close to 40 while the accumulation coefficient of the dystrophic lake was approximately 300. Among zoobenthos organisms, the highest Sr90 content was in the shells of mollusks at an accumulation coefficient 8-30 times higher that in the soft tissues of mollusks. It was established that in aquatic plants, the accumulation coefficients vary greatly depending on the species and also on the season and the type of lake. Accumulation of Sr90 in the bottom soil depends on the nature of trophicity of the lake. (See also W76-06861) (Chilton-ORNL)
W76-06867

THE ROLE OF AQUATIC PLANTS IN THE MIGRATION OF SR90 IN SOME WATER RESERVOIRS OF THE LITHUANIAN SSR,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
N. F. Dushauskene-Duzh, Y. P. Marchyulenene, V. B. Nyanishkene, Y. Yankavichyute, and K. K. Yankyavichyus.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 35-42, 2 fig, 5 tab, 8 ref.

Descriptors: *Radioecology, *Aquatic plants, *Strontium, Plankton, Algae, Freshwater, Sea water, Migration, Radioisotopes, *Path of pollutants, Reservoirs.
Identifiers: *Accumulation coefficients.

Accumulation and removal of Sr90 by phytoplankton and freshwater and seawater algae were studied. Sr90 in a chloride form was introduced into aquariums at a rate of 0.00001 curie/liter. Studies showed that the most intensive accumulation of Sr90 in phytoplankton occurred during the first hours of its stay in the water containing radionuclides with the equilibrium level being reached on the 4th-8th day. Equilibrium level in the algae studied was generally attained in the same time. The most widespread aquatic plants yielding a greater biomass accumulated Sr90 well. (See also W76-06861) (Chilton-ORNL)
W76-06868

STUDY OF SR90/SR RATIO IN A LATVIAN SEASIDE LAKE,
Akademiya Nauk Latviiskoi SSE, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5C.
W76-06869

SR90/SR RATIO IN PLANKTON OF LATVIAN LAKES OF VARIOUS TYPES,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5C.
W76-06870

SR90 DISTRIBUTION IN WATER AND BOTTOM SEDIMENTS OF LATVIAN LAKES,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
D. R. Vadzis, and A. K. Kalninya.
In: Radioecology of Water Organisms, Vol. 2 Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 53-57, 1 fig, 2 tab, 5 ref.

Descriptors: *Radioecology, *Strontium radioisotopes, *Water pollution sources, *Bottom sediments, Lakes, Trophic levels, Distribution, *Path of pollutants, Lake sediments.

Investigations showed that Sr90 concentrations in lake water increased from spring to the end of the vegetative period. Distribution of Sr90 differed between the water the upper layer of bottom sediments. 65-88% of the total amount of radioactive strontium was contained in the bottom sediments of ultraeutrophic and dystrophic lakes with only 12-35% being in the water. In the deep mesotrophic lake and the medium-depth eutrophic lake, the bottom sediments contained only 9-25% of the total amount of Sr90 and the water contained 75-91%. (See also W76-06861) (Chilton-ORNL)
W76-06871

SORPTION OF SR90 BY BOTTOM SEDIMENTS OF A FRESHWATER LAKE,
Akademiya Nauk SSSR, Sverdlovsk, Inst. of Plant and Animal Ecology.
S. A. Lyubimova.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 58-61, 1 fig, 1 tab, 4 ref.

Descriptors: *Radioecology, *Bottom sediments, *Strontium radioisotopes, *Cesium, Radioisotopes, Migration, Distribution, Freshwater, Lakes, Soils, Lake sediments.
Identifiers: *Accumulation coefficients.

The highest accumulation coefficients for both Sr90 and Cs137 were found to be those of peat and clay soils. For almost all soils, higher accumulation factors and more stable fixation of Cs137 are observed in comparison with Sr90. This was explained by the greater mobility of Sr90 and, consequently, differences in the forms in which radionuclides were present in the soils. (See also W76-06861) (Chilton-ORNL)
W76-06872

RATIO BETWEEN CS137 AND K ACCUMULATION COEFFICIENTS IN FRESHWATER ORGANISMS,
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii
For primary bibliographic entry see Field 5C.
W76-06873

ENVIRONMENTAL NA22 IN FRESHWATER ECOSYSTEM STUDIES,
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
For primary bibliographic entry see Field 5C.
W76-06874

NATURAL RADIOELEMENTS IN CONTEMPORARY BOTTOM SEDIMENTS OF ESTONIAN LAKES,
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
N. G. Morozova.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 70-73, 1 tab, 1 fig, 3 ref.

Descriptors: *Radioecology, *Thorium, *Radium, *Bottom sediments, Radioisotopes, Lakes, Freshwater, Lake sediments.

The content of radioactive elements in the bottom sediments of two lakes was found to be the same as in mineral soils and sedimentary deposits with variations with the limits of one order. Extreme values of Th and Ra differed respectively by 10-12 times for air-dry matter and 11-14 times for calcined matter. Bottom sediments of the two lakes had almost equal geochemical parameters with respect to Ra/Th ratio and content. In littoral area deposits the ratio was close to 3, in profundal deposits-3, and in organogenic deposits-2. (See also W76-06861) (Chilton-ORNL)
W76-06875

ON ACCUMULATION OF SR90 AND CS137 BY SOME FISH SPECIES IN FRESHWATER RESERVOIRS,
Kazan Inst. of Biology (USSR).
For primary bibliographic entry see Field 5C.
W76-06876

K, RB, AND CS EXCHANGE DYNAMICS IN FISH AND LAMPREY MIGRATING FROM SEA TO FRESH WATER (BEFORE SPAWNING),
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
For primary bibliographic entry see Field 5C.
W76-06877

THE ROLE OF WATER AND FOOD IN THE UPTAKE OF CS137 BY FISH ORGANISMS,
Ministerstvo Zdravookhraneniya S. S. S. R. Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5C.
W76-06878

DISTRIBUTION AND MIGRATION OF SR90 IN AN EXPERIMENTAL STILL WATER RESERVOIR,
Ministerstvo Zdravookhraneniya S.S.S.R., Moscow. Institut Biofiiki.
G. B. Pitkyanen, and N. G. Safronova.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 85-88, 1 tab, 1 fig, 7 ref.

Descriptors: *Radioecology, *Standing waters, *Lentic environment, *Strontium, Reservoirs, Water, Self-purification, Bottom sediments.

The goal of this study was to determine general regularities in the behavior of Sr90 in an experimental still water reservoir after a single aerosol contamination of the reservoir. The process of self-purification under these circumstances was a long one. Due to the redistribution of Sr90 over the profile of bottom deposits, the concentration of the radionuclide in water decreased by 2-3 times over ten year period. (See also W76-06861) (Chilton-ORNL)
W76-06879

ON THE ROLE OF THE ALIMENTARY ROUTE IN CS137 ACCUMULATION BY GUDGEON,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliningrad (USSR).
For primary bibliographic entry see Field 5C.
W76-06880

UPTAKE OF SR90 BY ORGANISMS OF GAMMARUS SP AND CHIRONOMUS F. L. PLUMOSUS L.,
Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of Botany.
For primary bibliographic entry see Field 5C.
W76-06881

DIFFERENCES IN THE SPECIFIC ACTIVITY OF CS137 IN THE COMPONENTS OF A FRESHWATER ECOSYSTEM,
Akademiya Nauk SSSR, Moscow. Inst. of Evolutionary Physiology.
For primary bibliographic entry see Field 5C.
W76-06882

MIGRATION OF SR90 FROM FISH ORGANISMS INTO OFFSPRINGS,
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 5C.
W76-06883

THE ROLE OF FRESHWATER FISH AS A POSSIBLE SUPPLIER OF P32 UNDER THE CONDITIONS OF POLLUTION OF NATURAL WATER RESERVOIRS BY THIS RADIONUCLIDE,
Ministerstvo Zdravookhraneniya S.S.S.R., Moscow. Institut Biofiziki.
M. M. Saurov, K. B. Korotkov, G. I. Gneusheva, G. P. Novoselova, and T. A. Tribunskaya.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, (1973). p 105-109, 3 tab, 3 ref.

Descriptors: *Radioecology, *Phosphorus, *Water pollution, Radioisopopes, Fish, Reservoirs.

The accumulation of P32 by some species of freshwater fish was studied to assess the role of fish as possible suppliers of the radionuclide to human organisms. The accumulation of P32 was found to depend upon the fish species, its age, and the degree of enrichment of the organs and tissues with stable P. From a contaminated reservoir, the accumulation of P32 in fish was found to be 40-200 times that of the water. (See also W76-06861) (Chilton-ORNL)
W76-06884

BIOLOGICAL EFFECTS OF RU106 AND J131 ON WATER ORGANISMS,
Nauchno-Issledovatelskii Institut Radiatsionnoi Gigieny, Leningrad (USSR).
For primary bibliographic entry see Field 5C.
W76-06885

SOME DATA ON COMPARATIVE EVALUATION OF RADIOACTIVE AND CHEMICAL POLLUTION FACTORS IN FRESHWATER RESERVOIRS,
Scientific Research Inst. of Radiation Hygiene, Leningrad (USSR).
V. N. Gus'kova, L. F. Radionova, N. I. Mashneva, V. M. Kupriyanova, and A. I. Tikhonova.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 115-118, 3 tab.

Descriptors: *Radioecology, *Water pollution, Chemical wastes, Radioisotopes, Freshwater, *Reservoirs, Radium, Cesium, Cobalt, Chemicals, Toxicity, Pollutant identification.

Experiments were conducted on the effects of one-time separate contamination of experimental water reservoirs with Ra226, Cs137, Co60, hexamethylene diamine, methyl mercury and cobalt under identical conditions. When the habitat was contaminated by the radioactive substances, no deaths of any species of the experimental aquatic organisms occurred. The influence of the chemical substances revealed various degrees of toxicity. Cobalt and methyl mercury had a deadly effect on all species while hexamethylene diamine had an insignificant effect only on the infusorians. (See also W76-06861) (Chilton-ORNL)
W76-06886

ARTIFICIAL RADIOACTIVITY OF SEA WATER AND FOOD HYDROBIONTS OF THE WORLD OCEAN,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliningrad (USSR).
S. A. Patin, and A. A. Petrov.
In:Radioecology of Water Organisms, Vol 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 119-124, 2 tab, 2 fig, 14 ref.

Descriptors: *Radioecology, *Radioactivity, *Sea water, *Aquatic life, Strontium, Cesium, Water pollution, Oceans.

Contamination of the World Ocean waters was compared with the levels of the content of long-lived radionuclides in various inland seas. Two characteristic trends were observed from the data. One of them reflects some decrease in the concentrations of Sr90 and Cs137 in oceanic waters, particularly in the Pacific Ocean, and the other reflects an increase of Sr90 in inland seas. A correlation was found between the content of radionuclides in water and in hydrobionts. (See also W76-06861) (Chilton-ORNL)
W76-06887

SR90 IN THE WATER-ATMOSPHERE INTERFACE,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
V. I. Timoshchuk.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 125-128, 1 tab, 14 ref.

Descriptors: *Radioecology, *Strontium, *Air-water interface, Radioisotopes, Fallout, Air pollution.

Under conditions of a calm or slightly agitated water surface, 20 meters from shore at a depth of 2.7-3.0 meters, the values of Sr90 concentration in the interface were found to be 60-90% higher than at the bottom. It was concluded that this effect of higher Sr90 concentration in the water-air interface was a result of the processes developing in the surface layer and not of atmospheric fall-out of radionuclides. (See also W76-06861) (Chilton-ORNL)
W76-06888

SR90 AND CS137 IN SURFACE WATERS OF THE BALTIC, NORTH, IRISH, AND NORWAY SEAS,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliningrad (USSR).
N. I. Buyanov, and Y. M. Petrov.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 129-132, 2 tab, 1 fig, 9 ref.

Descriptors: *Radioecology, *Strontium, *Cesium, Surface waters, *Oceans, Radioisotopes, Runoff, Fallout.
Identifiers: *North Sea, *Irish Sea, *Norway Sea.

Concentrations of Sr90 and Cs137 in seas of the Northeastern Atlantic Oceans showed a gradual increase toward the surfaces of the Baltic, North, and Norway seas. Concentrations in surface and littoral waters were found generally to be higher than in waters with a higher salinity. These results stress that the main role in the formation of the concentration field of radionuclides, along with effluent waters, belongs to shore runoff rather than to atmospheric fallouts. (See also W76-06861) (Chilton-ORNL)
W76-06889

CS137 AND SR90 IN THE SEA OF AZOV,
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
O. M. Aleksanyan.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 133-135, 6 ref.

Descriptors: *Radioecology, *Strontium, *Cesium, Surface waters, *Oceans, Radiosiotopes.
Identifiers: *Sea of Azov.

The concentrations of Sr90 and Cs137 in the Azov waters were found to vary widely depending upon the region and water salinity. This was explained

by spatial and temporal variations in the content of the elements, as well as by the pecularity of hydrodynamic regime of surface waters. (See also W76-06861) (Chilton-ORNL)
W76-06890

ACCUMULATION OF CS137 BY INDUSTRIAL FISH SPECIES IN THE CASPLAN SEA,
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
For primary bibliographic entry see Field 5C.
W76-06891

MECHANISMS OF ACCUMULATION OF RADIOACTIVE AND STABLE SR BY NORTHERN MARINE ALGAE UNDER NATURAL AND EXPERIMENTAL CONDITIONS,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliingrad (USSR).
For primary bibliographic entry see Field 5C.
W76-06892

COMPARATIVE EVALUATION OF THE ACCUMULATION DYNAMICS OF SOME CORROSION AND FISSION GROUP RADIONUCLIDES AND ALPHA EMITTERS BY NORTHERN MARINE ALGAE,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliningrad (USSR).
For primary bibliographic entry see Field 5C.
W76-06893

RADIOACTIVE CONTAMINATION OF COMMERCIAL HYDROBIONTS OF THE WESTERN BASIN,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kainingrad (USSR).
For primary bibliographic entry see Field 5C.
W76-06894

RADIOECOLOGICAL CONCENTRATION PROCESSES IN THE WATER-FISH LINE,
Scientific Research Inst. of Radiation Hygiene, Leningrad (USSR).
For primary bibliographic entry see Field 5C.
W76-06895

ACCUMULATION OF SR90, CA, AND SR BY FISH IN SEAS AND OCEANS,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06896

ACCUMULATION OF RADIOACTIVE AND STABLE ZINC BY BLACK SEA ALGAE CYSTOSEIRA BARBATA AND ULVA RIGIDA,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06897

ON TH234 ACCUMULATION BY MARINE ORGANISMS,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06898

MATHEMATICAL MODEL OF SR90 EXCHANGE BETWEEN CYSTOSEIRA AND MARINE WATER,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06899

RADIOECOLOGO-BIOCHEMICAL APPROACH TO THE STUDY OF THE COBALAMINE CYCLE IN THE OCEAN,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06900

THE ROLE OF SOME POLYSACCHARIDES OF BROWN ALGAE IN THE EXTRACTION OF SR90 FROM SEA WATER,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06901

INVESTIGATIONS ON THE ADSORPTION OF CO60 AND CS137 ON SURFACES OF BROWN ALGAE AND GLASS UNDER EXPERIMENTAL CONDITIONS,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliningrad (USSR).
For primary bibliographic entry see Field 5C.
W76-06902

INFLUENCE OF SALINITY AND CONCENTRATION OF SR AND CA IN WATER ON THE SR90 ACCUMULATION BY CYSTOSEIRA,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5C.
W76-06903

WATER QUALITY IN VICINITY OF FENTON HILL SITE, 1974,
Los Alamos Scientific Lab., N.Mex.
W. D. Purtymun, W. H. Adams, and J. W. Owens.
Available from the National Technical Information Service, Springfield, Va., 22161, as LA-6093, $3.50 in paper copy, $2.25 in microfiche. Report LA-6093, September 1975. 16 p, 3 tab, 4 fig, 6 ref. W-7405-ENG-36.

Descriptors: *Water quality, *Environmental effects, Water pollution effects, Uranium, New Mexico, Data collections.
Identifiers: *Environmental impact studies.

Data on the quality of water from the Fenton Hill Site vicinity were collected and analyzed during 1974 as part of a continuing program of environmental impact studies. Activities at the Fenton Hill Site in Jemez Mountains are involved in geothermal experimental studies. Water was collected and analyzed from nine surface water stations, eight ground water stations, and the drilling operations at the site. Surface water in Jemez River contained a significant quantity of sodium and bicarbonate as did ground water from the Cenozoic Volcanics. Water in the main zone of saturation penetrated by test hole GT-2 was highly mineralized. Water in the lower section of the test hole contained a higher concentration of uranium, characteristic of water in contact with granite rock. (Chilton-ORNL)
W76-06909

A METHODOLOGY FOR IMPACT ASSESSMENT IN THE ESTUARINE/MARINE ENVIRONMENT,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6G.
W76-06910

RELATIONSHIP OF GEOMORPHOLOGY TO ORIGIN AND DISTRIBUTION OF A HIGH CHARGE VERMICULITIC SOIL CLAY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-06926

HORIZONTAL DIFFUSION CHARACTERISTICS IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-06929

LAKE MICHIGAN WATER QUALITY AND LAKE BED SURVEY, 1973,
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
R. Schacht, L. Kolczak, and W. Matsunaga.
1973. 75 p, 11 fig, 53 tab.

Descriptors: *Lake Michigan, *Water quality, *Monitoring, *Water pollution sources, *Environmental effects, Ecology, Chemical properties, Evaluation, Analytical techniques, *Surveys, Water analysis, Ammonia, Phosphorus, Pesticides, Coliforms, Chlorides, Fluorides, Phenols, Sulfates, Surface waters, Lake beds, Coliforms, Effluents, Discharge(Water), Radioisotopes, Industrial wastes, Sewage.
Identifiers: Lake Michigan survey, Bacteriological quality, *Lake bed survey, Fecal coliform, Cyanides, Total dissolved minerals, Phthalates.

The Illinois Environmental Protection Agency reported in this report the results of the Lake Michigan Water Quality and Lake Bed Survey for 1973. The survey is conducted on a continuing basis to evaluate the ecology and the chemical and bacteriological quality of Lake Michigan. Data on lake water quality were obtained from: (1) shore water sampling sites, (2) municipal water filtration plants, and (3) lake monitoring stations located 5 mi offshore. Tabulated results of the analyses were given. Specific problems identified included concentrations of ammonia, phosphorus, and fecal coliform which continue to be found at undesirable levels at a large number of sampling stations. Samples of the lake bed identified areas of pollution at some near-shore stations. Local problems at times have developed and resulted in the closing of some Lake County beaches. (Henley - ISWS)
W76-06937

WATER RESOURCES PROBLEMS RELATED TO MINING.
American Water Resources, Association, Minneapolis, Minn.
For primary bibliographic entry see Field 5G.
W76-06938

PREPLANNING MINING OPERATIONS TO REDUCE THE ENVIRONMENTAL IMPACT OF MINE DRAINAGE ON STREAMS,
Union Carbide Corp., Tarrytown, N. Y. Aquatic Environmental Sciences.
For primary bibliographic entry see Field 5G.
W76-06939

THE HYDROLOGY OF AN ACID MINE PROBLEM,
Idaho Univ., Moscow.
For primary bibliographic entry see Field 5G.
W76-06942

RADIOCHEMICAL POLLUTION FROM PHOSPHATE ROCK MINING AND MILLING,
National Field Investigations Center Denver, Colo.
J. V. Rouse.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 65-71. 7 ref.

Descriptors: *Mining, *Phosphates, *Pollutants, *Florida, Radium radioisotopes, Radioactivity, Air pollution, Water pollution, Radioactive wastes, Spoil banks, Slime, Solid wastes, Waste dumps, Gypsum, Groundwater, Infiltration,

Mineral industry, Mills, Industrial wastes, Industrial water.

Phosphate mining and milling is a major segment of the U.S. mining industry. The United States produces 45% of the world's supply of phosphate fertilizer. This mining and milling of phosphate rock has been responsible for major water pollution problems of a conventional nature in the past. Recent data indicate that the industry is also responsible for major, unrecognized radiochemical pollution of water and air, and the generation of radioactive solid waste. The untreated liquid effluents from phosphoric-acid plants are 30 times the Maximum Permissible Concentration for radium-226. The byproduct gypsum generated by the industry contains approximately 25 picocuries of radium-226 per gram. Use of this material for building products would expose the population to radon decay products. Seepage of contaminated water from process ponds has contaminated large areas of groundwater. Treatment and stabilization measures exist to control the surface water discharge and the solid waste. Problems still exist with respect to seepage. Failures of slime ponds constitute a massive release of radium, measured in curies, to the aquatic environment. (See also W76-06938) (Sims - ISWS)
W76-06944

WATER RESOURCES PROBLEMS AND SOLUTIONS ASSOCIATED WITH THE NEW LEAD BELT OF S.E. MISSOURI,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 5G.
W76-06948

POTENTIAL OF MINE AND MILL SPOILS FOR WATER QUALITY DEGRADATION,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
D. B. McWhorter, R. K. Skogerboe, and G. V. Skogerboe.
In: Water Resources Problems Related to Mining; Proceedings No. 1, JUne 1974. American Water Resources Association, Minneapolis, Minnesota, p 123-137. 8 fig, 3 rab, 9 ref.

Descriptors: *Mining, *Mills, *Water pollution source, *Spoil banks, *Colorado, Groundwater, Runoff, Streams, Water quality, Mineral industry, Coal mines, Strip mines, Mine wastes, Pollutants, Pollutant identification, Chemical analysis.

An investigation into the pollution potential and current water quality degradation attributable to mine and mill spoils was conducted at two sites in Colorado. The chemical characteristics of the spoils were determined and correlated with the chemical makeup of water which has passed through and over the spoils. Monthly in-stream water quality measurements were made upstream and downstream of the spoils to determine the degree of water quality degradation. Soluble salts, principally calcium, magnesium, sodium, and sulfate, were found to be the major contaminants. (See also W76-06938) (Sims - ISWS)
W76-06949

COAL MINING AND ITS EFFECT ON WATER QUALITY,
Ohio Univ., Athens. Dept. of Geology.
M. U. Ahmad.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 138-148. 1 fig, 1 tab, 27 ref.

Descriptors: *Mining, *Coal mines, *Water pollution source, *Acid mine water, Mine drainage, Water quality, Groundwater, Streams, Surface waters, Pyrite, Acids, Chemistry, Chemical reactions, Strip mines, Drift mining, Pollutants.

Coal mining has seriously degraded the water quality of streams and some underground aquifers in Appalachia and other parts of the U.S.A. In the Appalachian region, about 6,000 tons of sulfuric acid are being produced daily through oxidation of pyrite. The mining of coal has at the present time seriously distrubed this interrelated hydrological system in over 11 million acres of land mined for coal in the U.S.A. Strip mining oftern lowers the water table in the undisturbed land by increasing the surface area over which water can be lost through seepage face, subsequent leaching of the pyrite, and then the introduction of acid and salts into the streams of the mined area. Large areas of the stripped land can not supply good quality water. Rural water supplies in coal mining districts are being seriously threatened by stripping. In areas where the overburden is thick, underground mining is practiced. Large amounts of coal are left in these mines and oxidation is going on. The primary vehicle of transport for the oxidation product is the flowing groundwater. Hundreds of unnatural springs are discharging highly acidic water into our streams. Fifty years of coal mining have left serious scars on our land and polluted 13,000 miles of streams. No effective method has yet been developed to abate this problem. (See also W76-06938) (Sims - ISWS)
W76-06950

GROUND WATER LEACHING OF JIG TAILING DEPOSITS IN THE COEUR D'ALENE DISTRICT OF NORTHERN IDAHO,
Idaho Univ., Moscow.
P. N. Norbeck, L. L. Mink, and R. E. Williams.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 149-157. 10 fig, 4 ref.

Descriptors: *Mining, *Spoil banks, *Groundwater, *Water pollution sources, *Idaho, Mineral industry, Heavy metals, Mine wastes, Acids, Salts, Acid mine water, Lead, Zinc, Metals, Rivers, Alluvial channels, Sediments.
Identifiers: *Coeur d'Alene Mining District(Idaho), Tailing deposits.

The Coeur d'Alene Mining District of northern Idaho has been world famous for its production of lead, silver, zinc and antimony for over 80 years. The age of the district and the large-scale production during this period have resulted in many environmental impact problems within the district. Extensive deposits of jig tailings produced near the turn of the century are now affecting the quality of ground and surface waters throughout the basin. The major problems are the result of low pH and high heavy metal concentrations. Investigations of water table configuration, aquifer boundaries, ground and surface water quality and the geometry and extent of old tailings deposits have revealed that when groundwater is exposed to the old tailings, bacteriological and chemical leaching of heavy metal occurs. Groundwater can encounter tailings if this material is dumped at sites which seasonally lie below shallow groundwater flow systems or through artificial recharge by tailing ponds. Wells sampled throughout the valley indicated significantly high concentrations of heavy metals present within the groundwater. In some areas of groundwater discharge statistically significant increases of heavy metal concentrations were noted within surface waters of the area. Techniques designed to solve the groundwater and surface water pollution problem of the area rely heavily on control of the surface of the phreatic zone. (See also W76-06938) (Sims - ISWS)
W76-06951

GROUND-WATER MOVEMENT THROUGH AN ABANDONED TAILINGS PILE,
Idaho Bureau of Mines and Geology, Moscow.
D. R. Ralston, and A. G. Morilla.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 174-183. 7 fig, 4 ref. USBM H023065.

Descriptors: *Groundwater movement, *Spoil banks, *Mining, *Idaho, Mineral industry, Mine wastes, Piezometry, Piezometers, Instrumentation, Potentiometric level, Permeability, On-site data collections, On-site investigations.
Identifiers: Coeur d'Alene Mining District(Idaho), Tailing deposits.

Water quality standards have resulted in the construction of a number of tailings ponds in the Coeur d'Alene Mining District in northern Idaho. A number of ponds have been filled and abandoned in the district in the last several years. The abandoned tailings piles contain significant concentrations of heavy metals that may enter the ground and surface water in the valley by leaching of precipitation through the pile material. An abandoned tailings pile near Kellogg was selected as a study area. It is located on permeable alluvial material on the flood plain of the South Fork of the Coeur d'Alene River. A groundwater mound is evident under the east portion of the pile. It is possible that a low permeability zone formed by compaction near the bottom of the east side of the pile may be responsible for the mound. The dominant direction of flow under the eastern side is horizontal while a more marked downward component of flow is present in the west pile. Downward drainage in the east side of the pile is more limited than in the western portion. Precipitation is the only source of groundwater recharge to the tailings pile. (See also W76-06938) (Sims - ISWS)
W76-06952

WATER PROBLEMS IN ALBERTA OILSANDS DEVELOPMENT,
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 5G.
W76-06953

THE RELATION BETWEEN WATER CHEMISTRY AND MINERAL ZONATION IN THE CENTRAL CITY MINING DISTRICT, COLORADO,
Colorado School of Mines, Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
T. R. Wildeman, D. Cain, and R. A. J. Ramiriz.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 219-229. 2 fig, 4 tab, 22 ref.

Descriptors: *Mine drainage, *Water chemistry, *Mineral industry, *Colorado, Acid mine water, Mining, Chemical analysis, Chemistry, Pollutants, Pollutant identification, Water pollution sources, Pyrite, Rocks, Geology, Geochemistry, Metals, Metallurgy, Groundwater.
Identifiers: *Central City Mining District(Colo).

The analyses of water draining from eight mines within the Central City mining district, Colorado, were reported. The Central City district is a complex sulfide mineral deposit classified as a mesothermal type. There is a well-defined concentric zoning of the ore minerals in the district consisting of a central zone of pyrite veins surrounded by a peripheral zone of shalerite-galena veins, with an intermediate zone between the other two zones. It was found that concentrations of the base metals in the mine drainage change in a direct way within the zonation. Fe, Mn, Zn, Cu, Cd, and Pb are in highest concentration in drainages from the central zone and in lowest concentrations in drainages from the peripheral zone. It was suggested that the cause of this zonal variation is the weathering of pyrite which is in greatest abundance in the central zone, and which releases Fe(III) and H(+) which promote the dissolution of the other base-metal sulfides. So far, samples have been collected in the summer, fall, and winter; there are no significant seasonal variations in the

water chemistry. (See also W76-06938) (Sims - ISWS).
W76-06955

THE IDEFJORD: A DESTROYED MARINE ENVIRONMENT, (IN SWEDISH),
B. I. Dybern.
Fauna Flora 67(2), p 90-103. 1973.

Descriptors: Bacteria, Coliforms, Marine environment, Fish, Fjords, Invertebrates, Light, Oxygen, Sulfur, Salmon, Sewage, Water pollution sources, Thermocline.
Identifiers: Ide, Norway, Sweden.

The Idefjord is situated at the border between Norway and Sweden. Two sills in the outer part impede water exchage with the sea. The Fjord is very heavily polluted by untreated sewage and insufficiently treated wastes from a paper and pulp mill at Halden, Norway. Fresh water supply comes from 2 small rivers. This makes the surface water very brackish, while the deeper water layers have a rather high salinity. A halocline is formed between the 2 water layers, and the deep water easily stagnates. The temperatures of the deeper water remain low during the whole year. In summer the surface water is warmed up and a thermocline is formed between the 2 layers. A rich supply of organic substances depletes O2 levels, especially in the deeper water layers. Toxic H2S is formed and the bottoms are covered with partially decayed organic material. O2 deficit conditions may also arise in the surface water. The waste water from Halden is dark-colored and spreads as a thin layer over the whole surface of the fjord, impeding light penetration. The bad light and O2 conditions are mainly responsible for the almost total absence of plant and invertebrate life in the fjord. Stable populations exist only in the outermost and innermost parts. There are very few fish. Salmon migrate through the fjord to or from 1 of the rivers, but many of them die on the way. The content of coliform bacteria in the surface layer is high. The bottom water contains sulfur bacteria and S is deposited in the bottom sediments. As late as 40-60 yr ago the fjord contained a bottom fish fauna in all parts. The pollution conditions worsened especially in the 1950's and 1960's. They are now an international problem and negotiations are carried out between Sweden and Norway on how to restore the natural conditions. The best way is to build treatment plants at Halden.--Copyright 1975, Biological Abstracts, Inc.
W76-06988

PHOSPHORUS MODEL OF MUSKEGON WASTEWATER SYSTEM,
Robert S. Kerr Environmental Research Lab., Ada, Okla. Water Quality Control Branch.
C. G. Enfield, and L. E. Leach.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 101, No. EE6, p 911-916, December, 1975. 6 fig, 5 ref.

Descriptors: *Model studies, *Waste water treatment, *Phosphorus, Laboratory investigation, Kinetics, Soils, Sorption, Water pollution effects, Computers, Waste disposal.
Identifiers: Land application, Phosphorus removal, Muskegon(Mich).

A model has been developed for the Muskegon County, Michigan, land application waste water treatment system, simulating vertical movement and sorption of phosphorus. The purpose of the investigation was to predict how the system would function with respect to the applied phosphorus based on: proposed operating conditions, the constraints of the mathematical model, and laboratory measurements of the kinetics of phosphorus sorption by Muskegon soils. Computer analysis provided six profiles (three operating conditions) for the responses of Rubicon Sand and Roscommon-Au Gres Sand to waste water application. For each soil type, predicted applications of phosphorus concentrated at 5.0 mg/liter at a rate of 0.0298 cm/hr, 5.0 mg/liter at a rate of 0.0595 cm/hr and 3.56 mg/liter at a rate of 0.0595 cm/hr were modelled. From the predictions, Rubicon sand appeared to be more effective in removing phosphorus. For the model, it was assumed that waste water would be applied at a constant rate throughout the year and that the influence of vertical variability of the soils was not considered. If the Muskegon system were to be operated under these model constraints, no problems in phosphorus removal should occur for the first 30 years of operation. (Kramer-FIRL)
W76-07011

DISTRIBUTION OF BDELLOVIBRIO BACTERIOVORUS IN SURFACE WATERS AND ITS ROLE IN SELF-PURIFICATION PROCESSES, (IN RUSSIAN),
Kuybyshevskii Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny (USSR).
S. N. Bukovskaya.
Gig Sanit 12, p 86-88, 1974.

Descriptors: *Self purification, Water purification, *Distribution, *Path of pollutants, *Bacteria, E coli, Water supply, Wastes, Salmonella, Surface waters.
Identifiers: Aeromonas, Anaerobes, *Bdellovibrio-bacteriovrous, Enterococci, Salmonella-decumanicidum, Saprophytes.

A study was done to detect Bdellovibrio bacteriovorus along a 350-km stretch of a river used widely as the main source of domestic and industrial water supply and which is a receiver of domestic and industrial wastewaters. The bacteria was isolated from 54.9% of the water samples. (Saprophytes, enterococci, anaerobes and Aeromonas were also isolated.) Fifty-eight strains of B. bacteriovorus were isolated: 32 on Escherichia coli 106 and 26 on Salmonella decumanicidum. In this river B. bacteriovorus may participate in self-purification of waste from fecal microflora.--Copyright 1975, Biological Abstracts, Inc.
W76-07024

A SOLVABLE MODEL OF 'SHEAR DISPERSION',
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2J.
W76-07067

RECOGNITION AND PREDICTION OF RUNOFF-PRODUCING ZONES IN HUMID REGIONS,
Agricultural Research Service, Danville, Vt.
For primary bibliographic entry see Field 2E.
W76-07073

HYDROCHEMICAL REGIME AND CHEMICAL COMPOSITION OF OLIGOTROPHIC BOG WATERS,
I. L. Kalyuzhnyy, and L. Ya. Levandovskaya.
Soviet Hydrology, Selected Papers, No. 5, p 300-314, 1974. 2 fig, 5 tab, 7 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 222, p 99-118, 1974.

Descriptors: *Bogs, *Water chemistry, *Water pollution sources, Precipitation(Atmospheric), Chemistry, Ions, Cations, Pollutants, Pollutant identification, Water analysis, Path of pollutants, Water properties, Trace elements, Peat, Soils, Groundwater.
Identifiers: *USSR.

Bog waters that enter rivers have an injurious effect on hydraulic installations on rivers and reservoirs. The hydrochemical regime of oligotrophic bog waters were investigated on the basis of analysis and generalization of observational data on bog water chemistry obtained at specialized bog stations of the Main Hydrometeorological Service Administration. Investigations showed that despite the different locations of the oligotrophic bogs studied, their hydrochemical regime and the chemical composition of their waters have many similar features and depend on hydrometeorological factors. The total content of minerals in the waters of these bogs may vary from 8-10 to 50-70 mg/liter. The waters of highmoor bogs are distinctly sulfatic almost throughout the year and Ca(2+) predominates among the cations. The highest mineral content of the waters in all bogs is observed before the flood, when it reaches 60 mg/liter. This is favored by freezing, when the concentration of the ions increases because of their displacement from the freezing solution. The lowest mineral content is observed during the spring flood. The coefficient of variation of the total mineral content increases from the center of a bog to its periphery, and its value varies throughout the year. (Sims-ISWS)
W76-07079

SEDIMENTATION RATES AND MEAN RESIDENCE TIMES OF STABLE PB AND 210PB IN LAKE WASHINGTON, PUGET SOUND ESTUARIES AND A COASTAL REGION,
Washington Univ., Seattle. Coll. of Fisheries; and Washington Univ., Seattle. Lab. of Radiation Ecology.
W. R. Schell.
Available from the National Technical Information Service, Springfield, Va., 22161 as RLO-2225T14-6 $4.00 in paper copy, $2.25 in microfiche. Report RLO-2225-T14-6, June 1974. 40 p, 5 fig, 14 ref. AEC AT(45-1)-2225-TA-14, EPA R-800357.

Descriptors: *Lead, *Sediments, *Coasts, *Washington, Sedimentation, Sedimentation rates, Estuaries, Lakes, Bays, Rivers, Heavy metals, Pollutants, Water pollution, Pollutant identification, Lead radioisotopes, *Path of pollutants.
Identifiers: *Lake Washington(Wash), *Puget Sound(Wash), *Frazer River(Wash), Residence time.

Core and water samples have been analyzed for 210Pb and Pb in Lake Washington and the marine environment of Puget Sound. A systematic evaluation of geochemical process has been made by measuring the sedimentation rates, the density, and the water concentration to evaluate the atmospheric and water contributions of 210Pb and Pb to sediments. The mean residence time was evaluated in the several systems. In Lake Washington the mean residence time of Pb and 210Pb was 70-80 days; in the dynamic system of Bellingham Bay the mean residence time was 10 days; in the coastal station the mean residence time was 75 days; at the mouth of the Frazer River the mean residence time was estimated at 80-113 days. The sediments reflect the total input from aeolean and pluvial sources. In Lake Washington, the time history is shown by the three sedimentation rates measured: 0.58 mm/year before 1870, 4.5 mm/yr between 1890-1916 and 3.1 mm between 1916 and 1972. The stable lead concentrations in the sediments gave information on the anthropogenic input to Lake Washington which correlated well with the time history determined by sediment dating. (Sims - ISWS)
W76-07093

PHOSPHATE, SILICATE, NITRATE, AND AMMONIA IN LINDASPOLLENE, A NORWEGIAN LAND-LOCKED FJORD,
Bergen Univ. (Norway). Biological Station.
C. Lannergren.
Sarsia, Vol. 59, p. 53-66, 1975. 11 fig., 2 tab., 14 ref.

Descriptors: Chemical properties, *Fjords, *Phosphates, *Silicates, *Nitrates, *Ammonia, Diatoms, Limiting factors, Surface waters, Nitrites, Phytoplankton, Hypolimnion, Lake sediments, Denitrification, Europe, Phosphorus, Nitrogen, Runoff, Sewage effluents, Dissolved oxygen.
Identifiers: *Lindaspollene(Norway), North Sea.

The surface waters of the small land-locked fjord contained phosphate, nitrite/nitrate, and ammonia concentrations similar to those in the North Sea. The silicate concentration was higher in the winter. Nitrogen and silicates limited phytoplankton production. Phosphates, silicates, and ammonia accumulated (in bottom waters). Phosphates were liberated from sediment. Due to denitrification, the inorganic combined nitrogen content decreased. Nutrient replenishment from bottom or adjacent waters after plant growth was more important than nutrient transport from land. In January and December, bottom water showed an increase of 0.2 ton phosphate phosphorus and 1.7 ton silicate. The nitrite/nitrate nitrogen concentration decreased 1.6 ton, but was partly compensated for by an increase of 0.6 ton ammonia nitrogen. The estimated contributions from freshwater runoff were: nitrate nitrogen 2.0, phosphate phosphorus 0.2, silicates 100, and ammonia nitrogen 0.7 tons/year. Domestic sewage supplied about 0.3 ton phosphate phosphorus and 1.5 tons nitrate nitrogen. Large amounts of nutrients were probably stored in the sediment in undissolved and reduced forms, so fast oxygen consumption and increased nutrient release from sediments can be expected when bottom water is exchanged with oxygen-rich water. (Buchanan-Davidson--Wisconsin)
W76-07098

THE ENVIRONMENTAL IMPACT OF FERTILIZERS,
Agricultural Research Service, Fort Collins, Colo.
F. G. Viets.
CRC Critical Reviews in Environmental Control, Vol. 5, No. 4, p. 423-453, 1975. 10 tab., 103 ref.

Descriptors: *Fertilizers, *Beneficial use, *Environmental effects, *Water pollution, Nitrogen, Phosphorus, Nitrates, Surface waters, Groundwater, Agronomy, Nitrogen fixation, Forests, Grasslands, Nutrients, Runoff, Percolation, Precipitation(Atmospheric), Fallout, Agriculture, Soil erosion, Nitrification, Fertility, Crop production, Legumes, *Reviews.

Fertilizers are one source of nitrogen and phosphorus that can degrade surface water quality and increase nitrate in groundwater, but sewage disposal is probably the most important degrader. Natural forests and grasslands can conserve these nutrients, thus loss in runoffs and percolates is less than the amount received from precipitation and dry fallout. The negative environmental impact of phosphorus and nitrogen began when forests and grasslands were destroyed for agriculture. Agriculture causes soil erosion, sedimentation, and transport of phosphorus and nitrogen to water. Loss of soil organic nitrogen and partial conversion to nitrate due to break up of grassland was a major factor in nitrate accumulation in ground waters. Commercial fertilizers are used due to soil fertility depletion resulting from erosion, natural degradation, crop removal, consumption of animal products, and improvement of crop varieties, pest control, and yields. However, fertilizer use has permitted production of crops on a minimum of land, thus reducing erosion hazards, irrigation requirements, energy, pesticides, etc. In the future, emphasis will be placed on the efficient use of fertilizers to make every acre produce to near its potential. The negative and positive uses of fertilizers are discussed in detail. (Buchanan-Davidson--Wisconsin)
W76-07100

ZOOPLANKTON DIVERSITY IN FOUR NORWEGIAN FJORDS,
Trondheim Univ. (Norway). Biological Station.
For primary bibliographic entry see Field 5C.
W76-07102

THE EFFECT OF MICROORGANISMS ON PHYTOTOXICITY OF HERBICIDES. III. INTERACTION OF BACILLUS SP. 72 WITH VENZAR,
Wroclaw Univ. (Poland). Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-07105

PROCESSES CONTROLLING THE DISSOLVED SILICA DISTRIBUTION IN SAN FRANCISCO BAY,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5C.
W76-07107

NUTRIENT CONCENTRATIONS OF SURFACE WATERS IN SOUTHERN FLORIDA, SEPTEMBER 1970 TO APRIL 1975,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5A.
W76-07126

USE OF STATE ESTIMATION TECHNIQUES IN WATER RESOURCE SYSTEM MODELING,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. P. Lettenmaier, and S. J. Burges.
Water Resources Bulletin, Vol. 12, No. 1, p 83-99, February 1976. 7 fig, 1 tab, 14 ref.

Descriptors: *Water resources, *Model studies, *Water quality, Measurement, Design, Biochemical oxygen demand, Estimating, Equations, Algorithms, Systems analysis.
Identifiers: Kalman filters, Streeter-Phelps equation, Linear systems, Nonlinear, Divergence, Uncertainty analysis, *State estimation.

State estimation is a term loosely used to classify methods which combine a knowledge of the dynamics of evolution of a vector of state variables with a measurement of a function of some or all of the state variables to yield an estimate of the actual value of the state vector. Herein, a relatively straightforward illustration of the potential uses of State Estimation techniques in water resources modeling is given. Background theory for Linear and Extended Kalman Filters is presented. Application of the filter techniques to modeling BOD and oxygen deficit in a stream illustrates the importance of model conceptualization, model completeness, uncertainty in model dynamics, and incorporation of measurements and measurement errors. Potential applications of state estimation techniques to measurement system design, model building, assessment and calibration, and data extension are explored. (Bell-Cornell)
W76-07143

ECONOMIC AND ENVIRONMENTAL ASPECTS OF DAILY AND ANNUAL DAIRY MANURE SPREADING SYSTEMS IN A SMALL WATERSHED,
Pennsylvania State Univ., Reading. Extension Service.
For primary bibliographic entry see Field 5D.
W76-07161

A PLANNING STUDY ON DAIRY WASTES MANAGEMENT,
Webb (Albert A.) Associates, Riverside, Calif.
For primary bibliographic entry see Field 5D.
W76-07175

DAIRY LAGOON SYSTEM AND GROUNDWATER QUALITY,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
J. I. Sewell, J. A. Mullins, and H. O. Vaigneur.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 286-288.

Descriptors: *Lagoons, *Dairy industry, Tennessee, *Sampling, *Seepage, Coliforms, Streptococcus, Chloride, Nitrates, *Farm lagoons, *Farm wastes, Groundwater, Water quality.

In June, 1973, a manure lagoon and holding pond were constructed for a new 125-cow dairy at the West Tennessee Experiment Station. Research was initiated for determining lagoon seepage rates and the effects of lagoon operation on shallow groundwater quality. The lagoon was constructed in a terrace formation of fine sandy loam of low permeability to a depth of about 6 feet and sands with high permeability at depths from 6-20 feet. The normal water table depth varies from 8-20 feet and has a moderate gradient toward bottom land. Seven test wells located near the lagoon and holding pond and extending into the groundwater table were installed in June, 1973, Background levels of groundwater quality parameters were evaluated monthly. At startup, in April, 1974, and lagoon seepage was about one foot per week with full lagoon. A water balance is being maintaining by daily recording the operation of four flush tanks of known volumes. By August, 1974, lagoon seepage had decreased markedly. To date, water-table levels have shown little change due to system operation. Nitrate-nitrogen and chloride levels have shown little change. However, in the wells near the holding pond where the groundwater table is about 8 feet below the ground surface, fecal coliform and streptococci have tended to increase. Analysis of available data suggests that the lagoon system operation may have little effect on chemical levels but may increase bacterial concentrations on the downslope side. A system for recirculating lagoon effluent from the holding pond for flushing alleys is under construction. Quality parameters will be determined for the recirculated flush water. (See also W76-07154) (East Central)
W76-07185

SEEPAGE BENEATH FEEDYARD RUNOFF CATCHMENTS,
Southwestern Great Plains Research Center Bushland, Tex.
R. N. Clark.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 289-290.

Descriptors: *Feed lots, *Agricultural runoff, *Groundwater, Texas, *Seepage, Nitrates, Nitrites, Chloride, Soil water, *Farm wastes, Playas, Waste water treatment.
Identifiers: Soil sealing treatments, Clay liner, Incorporated bentonite.

Recent laws require collection and storage of all feedyard runoff for control of surface water pollution; however, seepage from these catchments offers a potential for ground water pollution. Research studies were begun in 1969 at Bushland, Texas, to evaluate the seepage and sealing effects of impounded feedyard runoff. Results are presented from two types of runoff catchments, one naturally occurring and one man-made. Some feedlots in the area are located near shallow, saucer-type natural lakes called 'playas' while holding ponds have been constructed near others to impound the runoff. Soil chemical data have been obtained for samples taken to a depth of 12 feet beneath a playa which has caught feedyard runoff since 1967. These data have been compared to those from an adjacent non-feedyard playa. Nitrate, nitrite, chloride, and soil water were

similar in both playas in 1969 and 1974; changes in the feedyard playa were slight from 1969 to 1974. Three soil sealing treatments were compared in three newly constructed holding ponds. The treatments were a clay liner, incorporated bentonite, and check. After the initial impoundment of runoff, water loss rates were similar for all basins. Water loss rate approximated the evaporation rate 45 days from initial filling. These studies show that seepage rates beneath feedyard runoff catchments are low and seepage from runoff catchments presents little danger of ground water contamination. (See also W76-07154) (East Central)
W76-07186

NUTRIENT LOSSES FROM MANURE UNDER SIMULATED WINTER CONDITIONS,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
T. S. Steenhuis, G. D. Bubenzer, and J. S. Converse.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 291-295.

Descriptors: *Winter, *Agricultural runoff, Temperature, Precipitation, Nitrogen, *Farm wastes, Nutrients, Waste disposal, Water pollution sources.
Identifiers: *Land spreading, *Nutrient losses.

Pollution caused by winter spreading of manure has received wide publicity. Research information necessary to quantify the effects of climatic factors on the rate of nutrient losses under winter conditions is needed. This research was undertaken to determine the effects of temperature and precipitation on the rate of nutrient transformation from winter spread manure and the surface transport mechanisms that place during the runoff cycle. To examine the pollution potential of winter spread manure with and without the effect of underlying soil layer, sample plots were covered with 20 cm of snow. Manure was applied as a urine-straw mixture or faeces at three depths within the snow layer. Plots were subjected to four cyclic temperature variations ranging from -8C to + 12C in an environmental chamber. Radiation conditions equivalent to a cloudy late January day were simulated. At the end of the snow melt period, plots were subjected to simulated rainfall. Eighty to ninety percent of the nitrogen was lost in the runoff from the snow with a water equivalent of 3 cm, when the urine-straw mixture was placed at the base or midpoint of the snow. Placement at the top resulted in only 10 to 15 percent of the originally applied N in the meltwater. Losses in runoff from simulated rain were inversely related to the amount lost in the snow melt. Five to twenty-five percent of the nitrogen of the faeces was lost in the snow melt process. The higher percentages were obtained for placement at the center and on top of the snow pack and subjected to a daily freezethaw cycle. Nitrogen losses from faeces were approximately 10 to 15 percent of the initial load when subjected to the simulated rain. (See also W76-07154) (East Central)
W76-07187

ANIMAL WASTE CONTRIBUTION TO NITRATE NITROGEN IN SOIL,
Pennsylvania State Univ., University Park.
L. F. Marriott, and H. D. Bartlett.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 296-298.

Descriptors: *Farm wastes, Application rates, Water pollution sources, Liquid wastes, *Dairy industry, Crop response, Soil water, *Groundwater, *Nitrogen, Sampling, Lysimeters, Nitrates.
Identifiers: *Soil injection, *Nitrate nitrogen.

Liquid dairy manure was injected on plots of orchardgrass at rates to supply 700-3500 pounds of nitrogen per acre per year for three successive years, and on orchardgrass, bluegrass and corn at rates to supply 200-600 pounds of nitrogen per acre. The concentration of nitrate nitrogen in soil water was determined on samples from suction lysimeters installed at depths of 1, 2, 3 and 4 feet. Crop yields were recorded and samples analyzed to measure nitrogen uptake. Soil samples to a depth of 4 feet were analyzed for nitrate and Kjeldahl nitrogen. The subsurface injection method provided complete control of malodors at the disposal site. Repeated applications of the high rates of manure resulted in increasing concentration of nitrate nitrogen in soil water at all depths of sampling. After applications were discontinued, there was a gradual reduction in nitrate nitrogen concentration with depth from 1 to 4 feet and with rate. The disappearance of the nitrate nitrogen from depths below the root zone indicates the potential for movement into ground water supplies. Manure rates supplying 300-600 pounds nitrogen per acre on bluegrass and orchardgrass increased the concentration of nitrate nitrogen in soil water at 3-4 feet to approximately two times the limit for potable water as set by the Public Health Service. The nitrate nitrogen level decreased 50% in the next growing season. These results are further evidence that the rate of application of animal waste must be adjusted to the crop requirements for N and to soil conditions to minimize the loss of nitrate nitrogen from the root zone. (See also W76-07154) (East Central)
W76-07188

EFFECTIVENESS OF FOREST BUFFER STRIPS IN IMPROVING THE WATER QUALITY OF MANURE POLLUTED RUNOFF,
Maryland Univ., College Par., Dept. of Agronomy.
R. C. Doyle, D. C. Wolf, and D. F. Bezdicek.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 299-302.

Descriptors: *Agricultural runoff, *Coliforms, *Streptococcus, *Nutrients, *Water quality, *Water pollution sources, *Farm wastes, *Dairy industry.
Identifiers: *Land spreading, *Forest buffer zones.

Objectives were to determine the movement of fecal coliform, fecal streptococcus, total soluble P, K, Na, NO3-N, NH4-N, and organic-N in runoff water from manured land and establish the effectiveness of forest buffer zones in improving the water quality of manure polluted runoff. Dairy manure was applied at the rate of 90 metric tons per hectare, 69% moisture, on 0.19 hectare of a Chester gravelly silt loam soil (Typic Hapludult; fine loamy, mixed, mesic) having a 4% slope and planted in alfalfa. The experimental site was located in the Piedmont physiographic province of Maryland. Runoff was collected from a 35-40% slope forest by means of dust pan lysimeters at 0, 3.8, 7.6, 15.2, and 30.5 meter intervals from the manured area. Runoff samples were taken for four natural rainfall events after an initial August 1973 manure application. A second 90 metric tons per hectare of manure was spread in November, 1973 and runoff from three subsequent rains was collected. Runoff at 0 meters displayed high concentrations of P, K, Na, and total N, but fecal coliform and fecal streptococci densities were not significantly higher than background levels. Runoff from the manured area was most highly contaminated in the first rain after manure application, and the runoff water quality showed a tendency to improve with each additional rain. The degree of pollution in the runoff collected at 0 meters increased during the winter. Fecal pollutants in runoff water or soil collected at distances of 3.8 meters or greater could not be substantiated by either the biological or chemical parameters measured. Similarly, no effect on the stream adjacent to the plot area was observed. (See also W76-07154) (East Central)
W76-07189

EFFECT OF ANAEROBIC SWINE LAGOONS ON GROUNDWATER QUALITY IN HIGH WATER TABLE SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
E. R. Collins, Jr., T. G. Ciravolo, D. L. Hallock, D. C. Martens, and H. R. Thomas.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 303-305.

Descriptors: Hogs, Groundwater, Water table, Soils, Lagoons, *Anaerobic conditions, *Coastal plains, *Sampling, Chemical properties, Biological properties, Nutrients, Coliforms, *Farm wastes, *Farm lagoons.
Identifiers: *High water table soils.

The effect of anaerobic swine lagoons on the quality of groundwater in the Coastal Plains was investigated at the Virginia Swine Evaluation Station (VSES) and at the Tidewater Research and Continuing Education Center (TRACEC). The lagoons are located on soils with high water tables near Suffolk, Virginia. Chemical and biological tests were conducted on groundwater sampled at various depths and distances from the lagoons. Constituents determined were nitrates, ammonia, soluble orthophosphates, chlorides, chemical oxygen demand, manganese, copper, zinc, calcium, potassium, magnesium, sodium, and fecal coliform. Wells were water-jetted to 10-, 15-, and 20-foot depths at 10-, 50-, and 100-foot distances from the lagoons. Groundwater samples were taken monthly since August, 1973. The wells were purged one day before sampling. Samples for chemical analysis were stored under ice and dry ice in the field and transferred to a freezer in the laboratory. Before chemical analysis, the samples were filtered through a 0.45 micron filter. The biological determinations were initiated shortly after sampling. Data from the wells at TRACEC indicated influences other than the lagoon on groundwater quality. For this reason, these wells have been abandoned. A new lagoon has since been constructed at this location. Future work will entail monthly monitoring of the groundwater around the new lagoon at TRACEC, monitoring the groundwater around a lagoon on a private farm, and more intensive monitoring of groundwater at VSES with the establishment of more wells. (See also W76-07154) (East Central)
W76-07190

SWINE WASTE LAGOONS AS POTENTIAL DISEASE RESERVOIRS,
Iowa State Univ., Ames. Dept. of Veterinary Pathology.
R. D. Glock, and K. J. Schwartz.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975. p 334-335.

Descriptors: *Diseases, *Pathogenic bacteria, Lagoons, *Liquid wastes, *Recirculated water, *Salmonella, *Farm wastes, *Farm lagoons, *Hogs.
Identifiers: *Flushing gutter systems, Dysentery.

The design, construction, and use of swine waste lagoons and pits have been thoroughly described but the question of whether pathogenic organisms can persist in liquid wastes and act as biological hazards has not been adequately considered. Systems utilizing recirculation of lagoon effluent in flushing gutter systems would seem to be especially hazardous. Two groups of 3 pigs each were deprived of fresh water but were fed anaerobic lagoon effluent from gutter-flush tanks on a farm with a history of swine dysentery and salmonello-

sis. Two similar groups were held as controls with free access to clean water. Effluent used to flush gutters was capable of initiating S. st. paul infections and clinical swine dysentery. Salmonella st paul was also isolated from the lagoon effluent. T. hyodysenteriae-like organisms were observed in low numbers but isolation attempts failed. Further surveys of swine waste lagoons and pits resulted in isolation of Salmonella from 4 to 13 anaerobic lagoons and from 1 of 3 sub-floor pits. Serotypes isolated included S. molade, S. st. paul, S. typhimurium, S. manhattan, and S. agona. Pathogenicity of the various serotypes isolated is not known but it seemed significant that, in 2 instances, the same serotypes were isolated both from lagoon effluent and from rectal swabs of swine on the same premises. There was some indication that isolations of Salmonella were more frequently accomplished during the colder seasons. These findings do not suggest that anaerobic lagoons are undesirable but that more study is needed to determine specific disease transmission hazards. The potential of swine wastes as Salmonella reservoirs also needs further clarification. (See also W76-07154) (East Central)
W76-07192

ESTIMATING QUANTITY AND QUALITY OF RUNOFF FROM EASTERN BEEF BARNLOTS,
North Appalachian Experimental Watershed, Coshocton, Ohio.
W. M. Edwards, and J. L. McGuinness.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975. p 408-411.

Descriptors: *Agricultural runoff, *Feed lots, *Cattle, Ohio, *Farm wastes, Water quality, Forecasting, Estimating.
Identifiers: *Prediction equation, Runoff quantity, Runoff quality.

Proposed EPA guidelines for feedlot effluent require that by 1983 all feedlot operations have the capacity to store runoff from 25-year, 24-hour rainfall. In view of these requirements, an analysis was made of runoff volume and quality from a typical unpaved beef barnlot in eastern Ohio. The measurements were made over a 4-year period on a 0.4 acre, 60 head barnlot watershed at the North Appalachian Experimental Watershed, Coshocton, Ohio. A prediction equation for daily runoff volume was developed by a multiple regression analysis of 181 runoff events. Rainfall amount and antecedent moisture content of the surface layer accounted for 75 percent of the storm runoff variability. Joint probabilities of various amounts of rainfall occurring with different antecedent soil moisture conditions were used to define maximum, minimum and mean daily runoff volumes at different times of the year. Inclusion of a rainfall intensity variable in the multiple regression did not improve the runoff volume prediction. The presence or absence of cattle in the lot at the time of the event also had no effect upon prediction of runoff volume. The seasonal distributions of N, P, K, and BOD concentrations in runoff were determined. Using long-term weather records, water quality data, and the runoff prediction equation, runoff volume and associated nutrient transport for 10- and 25-year frequency storms occurring at different times of the year were also estimated. The rainfall prediction was also used to extend runoff relations to paved lots. (See also W76-07154) (East Central)
W76-07193

DESIGN RUNOFF VOLUME FROM FEEDLOTS IN THE SOUTHWESTERN GREAT PLAINS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
V. L. Hauser.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975. p 426-428.

Descriptors: *Design, *Agricultural runoff, *Feed lots, Texas, Economics, Great Plains, Farm wastes, Management, Equations.
Identifiers: Southwestern Great Plains, Runoff control, Runoff equations.

The design of feedlot pollution control systems required an estimate of the runoff volume to be controlled. Federal and State regulations presently rely on the Soil Conservation Service (SCS) equation for runoff estimation. They also rely on the Weather Bureau Technical Publication No. 40 (TP 40) for estimates of the design storm, which, in Texas, is 24-hour rainfall expected once in 25 years. The accuracy of these present design procedures is examined. A recently published equation for runoff derived from runoff measurements on a feedlot at Bushland, Texas (near Amarillo) was tested against the more widely used SCS equation. Runoff was computed by each equation for each day with rain in a 35-year rainfall record from Bushland and in an 82-year rainfall record for Amarillo. These computed runoff amounts were analyzed to derive return frequency of runoff amount for the new Bushland equation and for the SCS equation. The results show that the presently used design method may compute up to 3 times as much runoff as the new Bushland equation. In addition, significant differences were found between 24-hour, 25-year return frequency rainfall found in TP 40 and the actual record from the two stations analyzed. Over estimation of the design runoff amount from feedlots causes wasteful expenditure in both runoff reservoir construction and the purchase of a disposal system. This research indicates the need for revision of design methods and requirements of law. (See also W76-07154) (East Central)
W76-07195

QUANTITY AND QUALITY OF BEEF FEEDYARD RUNOFF IN THE GREAT PLAINS,
Southwestern Great Plains Research Center. Bushland, Tex.
R. N. Clark, C. B. Gilbertson, and H. R. Duke.
Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 429-431.

Descriptors: *Agricultural runoff, *Cattle, *Great Plains, Water quality, *Farm wastes, Water pollution sources.
Identifiers: Runoff quantity, Runoff quality.

The Great Plains Region has become the world's largest confined cattle feeding area during the last 10 years. The region increased fed cattle production from 6 million in 1963 to over 14 million in 1973. Also, during the last decade, water quality control regulations have been established requiring the impoundment of runoff and waste water from these feedyards. Runoff studies were begun about 1967 at several locations throughout the Great Plains in order to characterize feedyard runoff as to quantity and quality. The objective is to combine these data and present them in a uniform format. Rainfall-runoff relationships are presented from seven feedyards from eastern Nebraska and eastern Colorado to South Texas. In all cases, the rainfall-runoff relationship was linear; however, the slopes varied from 0.36 to 0.86. Runoff did not begin until at least 1 cm (0.4 inch) of rainfall had occurred. The quality of runoff was quite variable at each location depending on rainfall intensity and duration, time since last runoff, and stocking rate. However, noticeable differences were found between the various research locations. The concentration of salts was less in eastern Nebraska and increased inversely with total rainfall to highest concentration in West Texas. (See also W76-07154) (East Central)
W76-07196

DIFFUSION AND MIGRATION OF POLLUTED WATER ALONG THE BELGIAN BEACHES. NEW EXPERIMENT INVOLVING DUMPING OF 100 KG RHODAMINE B: PRELIMINARY CONCLUSIONS, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Ostend. Laboratoire de Bacteriologie.
Z. Dartevelle, J. Pinon, R. Rousseau, and W. Deschacht.
Bull Inst R Sci Nat Belg Biol 50(8), p 1-18. 1974.

Descriptors: *Path of pollutants, Europe, Migration, *Beaches, *Water pollution sources, *Diffusion, *Rhodamine, Waste disposal, *Dye dispersion.
Identifiers: Flourometry, *Belgium.

A solution of 100 kg rhodamine B was introduced into a sewer which discharges into the sea. Discharge dispersion was observed and located by means of 4 optical theodolites and by aerial photographs. Water samples were collected in the colored plume and on its boundaries during a whole tidal cycle, and analyzed by spectrofluorimetry. The factors affecting water movements are complex. The drift apparently is mainly due to the wind. The predominating winds contribute to maintaining the waste water closely to the water line over a distance of several miles.--Copyright 1975, Biological Abstracts, Inc.
W76-07207

HYDRAULIC MODELING OF SHALLOW COOLING PONDS,
Iowa Inst. of Hydraulic Research, Iowa City.
For primary bibliographic entry see Field 5G.
W76-07212

STATISTICAL DESIGN BASIS FOR SUBMERGED DIFFUSER,
Quirk, Lawler and Matusky, New York.
T. E. Pease, and M. J. Skelly.
Journal of the Power Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. PO1, Proceedings paper No. 11408, p 11-22, July 1975. 10 fig, 2 tab, 12 ref.

Descriptors: *Lakes, *Oceans, *Thermal pollution, Hydrography, *Statistical methods, *Regulation, Powerplants, Waste disposal, Design, Environment, Pollution abatement, Equations, Evaluation, Methodology, *Diffusion.
Identifiers: *Diffusers, Environmental impact statements, Submerged orifices.

A comparison is made among discharge criteria for various atmospheric and aquatic emissions. The dependence of effluent plume size on water levels, ambient temperatures, and drift currents was empirically determined from model simulation. Predictions of the effluent plume size frequency distribution were made: (1) assuming the parameters are independent random variables; and (2) using a time series of lake levels, temperatures, and currents. The second method predicted less frequent occurrence of large plumes. It is concluded that: (1) statistical description of predicted thermal plumes represents a more realistic evaluation of environmental impact than prediction for a 'critical' condition; (2) readily available site data can be utilized to make statistical predictions of the effluent plume size for proposed outfalls; and (3) the effectiveness of design changes can be statistically evaluated and interpreted as frequencies with which given thermal criteria may be contravened. (Bell-Cornell)
W76-07214

PH PROFILES IN A RIVER SYSTEM WITH MULTIPLE ACID LOADS,
Massachusetts Inst. of Tech., Boston. Dept. of Civil Engineering.
J. G. Yeasted, and R. Shane.
Journal Water Pollution Control Federation, Vol. 48, No. 1, p 91-106,January 1976. 4 fig, 2 tab, 17 ref, 1 append. OWRT C-2183(No.3381)(3)

Descriptors: *Model studies, *Water pollution sources, *Path of pollutants, *Coal mine wastes, *Acid mine water, Acid streams, Mine acids, Mine drainage, Pyrite, Coal mines, Mine wastes, Industrial wastes, Water quality, Water pollution, Computer models, Pennsylvania.
Identifiers: *Kiskiminetas River basin(Pa), Loyalhenna Creek(Pa), Program BASIN.

A computer model capable of simulating the effects of multiple acid loads on the water quality of a free flowing, branched river system is described. With the State of Illinois water quality model, Program BASIN, as its basis, the model routes the chemical quantities, alkalinity and CO2 acidity through a branched river system. The effect of carbon dioxide transfer at the air-water interface is included in the routing procedures. Predicted values of alkalinity and CO2 acidity are used to compute pH at all node points. Field data needed to verify and apply the model are described together with sample application to the Kiskiminetas River Basin. (Bender-ISWS)
W76-07235

ANALYSIS OF ORGANIC COMPOUNDS IN TWO KRAFT MILL WASTEWATERS,
Southeast Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5A.
W76-07245

DYNAMIC BEHAVIOR OF VINYL CHLORIDE IN AQUATIC ECOSYSTEMS,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-07247

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON VINYL CHLORIDE AND POLYVINYL CHLORIDE.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W76-07249

THE PRINCIPLES OF SUBSTANTIATING PERMISSIBLE CONCENTRATIONS OF RADIOACTIVE SUBSTANCES IN FRESHWATER BODIES, (IN RUSSIAN),
A. N. Marei, and R. M. Barkhudarov.
Gig Sanit. 1, p 50-54, 1974.

Descriptors: *Radioactivity, *Radioisotopes, *Potable water, Food chains, *Path of pollutants, Public health, Water pollution, *Water quality standards.

Permissible irradiation doses for man accepted by national sanitary law were assumed as base in the standardization of radioactive isotopes in water bodies. The presence of radioactive isotopes in drinking water, their movement from water through the food chains and the action of ionizing radiation from the surface of the water body and the flood-lands were studied.--Copyright 1975, Biological Abstracts, Inc.
W76-07275

MICROFLORA OF THE WATERS OF ONE OF THE UNDERGROUND SPRINGS OF THE KARAKALPAK ASSR, (IN RUSSIAN),
Complex Inst. of Natural Sciences, Nukus (USSR). Karakalpak Div.
N. S. Sagidullaev.
Gidrobiol Zh. 10(1), p 65-67, 1974.

Descriptors: Aquatic plants, *Springs, *Ions, *Bacteria.
Identifiers: Karakalpak-SSR, *Underground springs, USSR, Liman.

An investigation was made of the microflora of an underground spring in the Karakalpak ASSR (USSR), located 25-30 km south of the summer and fall of 1971 at 3 typical sites: directly at the underground spring and on the southern and northern shores of the liman. Data are given on the ionic composition of the water and number of bacteria in the water of the spring and liman.--Copyright 1975, Biological Abstracts, Inc.
W76-07280

ASSESSMENT OF WATER POLLUTION OF THE DANUBE RIVER IN THE BULGARIAN SECTION (845-375 RIVER KM) ACCORDING TO INDICES OF THE OXYGEN REGIME, (IN GERMAN),
Bulgarian Academy of Sciences, Sofia. Inst. of Hydrology and Meteorology.
K. Iwanow.
Arch Hydrobiol Supplementb. 44(3), p295-300, 1974.

Descriptors: Water pollution sources, *Pollutant identification, Rivers, Europe, *Dissolved oxygen, *Biochemical oxygen demand, Oxidation, Water chemistry.
Identifiers: *Danube River(Bulgaria).

The degree of pollution of river water was examined according to the indices of dissolved O2, O2 saturation, permanganate oxidation and biochemical O2 demand, measured after 5 days interval on the course of 6 expeditions in 1967-1970 and also monthly at 7 hydrochemical stations.--Copyright 1975, Biological Abstracts, Inc.
W76-07292

DECOMPOSITION OF NITROGENOUS ORGANIC SUBSTANCES IN SURFACE WATERS, (IN RUSSIAN),
Hygieny a Epidemiologie, Prague (Czechoslovakia). Institut.
For primary bibliographic entry see Field 5C.
W76-07303

A REPORT ON IRON DEPOSITS IN LAKE CHAD (1970-1973), (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena).
J. Lemoalle.
Cah O R S T O M Ser Hydrobiol. 8(1), p 35-40, 1974.

Descriptors: *Iron, Lakes, Africa, *Seasonal, Flood plains, Survey, Distribution patterns.
Identifiers: *Lake Chad.

Reactive Fe is Fe which is present in solution after 10 min of boiling of a raw water sample with 4% HCl. The reactive iron brought to lake Chad by the Chari and Lagone rivers was measured weekly. Although the water volume reaching the lake has decreased from 1970-71 to 1972-73, the iron load brought to the lake has increased: 98, 110 and 147 thousand metric ions for 1970-71, 1971-72 and 1972-73, respectively. This shows the importance of the 'flood plains' which were not flooded the last season, due to an unusually low flood. A survey of the seasonal pattern of dissolved silica during the last year explains, in part, the variations in reactive Fe according to the ratio between waters which have been either running on or seeping through the soils in the catchment area.--Copyright 1975, Biological Abstracts, Inc.
W76-07304

CONTRIBUTION TO THE KNOWLEDGE OF THE DISTRIBUTION, BIOMASS AND DRIFT OF THE ZOOPLANKTON IN THE CZECHOSLOVAK-HUNGARIAN STRETCH OF THE DANUBE, (IN GERMAN),
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Lab. of Fisheries Hydrobiology.
For primary bibliographic entry see Field 5C.
W76-07306

DISTRIBUTION, PHYTOCENOLOGY AND PRODUCTIVITY OF NYMPHAEACEAE IN RESERVOIRS OF THE DNIEPER CASCADE, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev (USSR). Central Republican Botanical Garden.
For primary bibliographic entry see Field 5C.
W76-07314

EFFECT OF AERATION ON MICROBIOLOGICAL PROCESSES IN FLOODED SOIL, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. of Microbiology and Virology.
For primary bibliographic entry see Field 2G.
W76-07363

HEAVY METAL CONTENT IN THE SEDIMENTS OF THE SOUTHERN PART OF THE COEUR D'ALENE LAKE,
Idaho Univ., Moscow. Dept. of Chemistry.
For primary bibliographic entry see Field 2H.
W76-07394

LINDANE RESIDUES IN THE SOUTHERN COASTAL AQUIFER OF ISRAEL,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science; and Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
N. Lahav, and Y. Kahanovitch.
Water Air Soil Pollut. 3(3), p 253-259, 1974.

Descriptors: *Pesticide residues, Soils, Coasts, Groundwater, Wells, Aldrin, Aquifers, DDD, DDT, Dieldrin, Heptachlor, Pesticides.
Identifiers: Bhc, Epoxide, Israel, Lindane.

Water samples from 12 wells on the coastal aquifer of Israel were analyzed for gamma-BHC (lindane), alpha-BHC, aldrin, opl DDD, ppl DDT, dieldrin, heptachlor and heptachlor-expoxide. Lindane was found in 5 wells with concentrations ranging from traces to 15 ppt. Alpha-BHC was detected in 1 well (4 ppt). None of the other pesticides could be detected. The wells where lindane was detected were between 13 m-26 m deep and the soil above the water table was sandy. Lindane occurrence is attributed to heavy localized applications and downward movement of water in considerable quantities. Analysis of the potential mobility of lindane indicates that it can be in sandy soils.--Copyright 1975, Biological Abstracts, Inc.
W76-07396

INVESTIGATION OF TRONDHEIM FJORD: ORIENTATION TO PLANNING AND PRELIMINARY RESULTS, (IN NORWEGIAN),
Norges Tekniske Vitsenskapsakademi, Trondheim.
For primary bibliographic entry see Field 5A.
W76-07405

DECOMPOSITION OF PARTICULATE ORGANIC MATERIALS IN TOKYO BAY AT SUMMER STAGNATION PERIOD IN 1972,
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W76-07406

ECOLOGY OF THE OGUN RIVER ESTUARY, NIGERIA,
Ibadan Univ. (Nigeria). Dept. of Geology.
For primary bibliographic entry see Field 2L.
W76-07411

SURVIVAL OF LISTERIA MONOCYTOGENES IN SOIL AND WATER,
Michigan Univ., Ann Arbor. Dept. of Wildlife and Fisheries.
For primary bibliographic entry see Field 5C.
W76-07423

THE CONTAMINAION OF DUTCH SOILS WITH MERCURY AND A FEW OTHER HEAVY METALS,
Instituut Voor Toepassing Van Atoomenergie in de Landbouw, Wageningen (Netherlands).
M. J. Frissel, P. Poelstra, and N. Van Der Klugt.
Geol Mijnbouw. 53(4): 163-170. Illus. 1974.

Descriptors: Mercury, Heavy metals, Soils, Sands, Path of pollutants, Clays, Organic matter adsorption, Model studies, Potable water, Pesticides.
Identifiers: Rhine River, *Netherlands.

Soil constituents such as clay minerals, sands and organic materials are described. The properties which control the adsorption of traces of heavy metals and pesticides were studied. The behavior of Hg in Dutch and other western European soils is discussed. Because some of the drinking water companies in western Holland get their water from the River Rhine by filtration through dunes, the migration of Hg in soils got serious attention. Most Hg compounds (Hg, HgC12, HgC1CH3) do not migrate in soil, but the volatile Hg (Ch3)2 migrates quickly. The contamination of soils is partly caused by agricultural measures and partly by flooding with water from the Rhine. The main Hg source comes from the wash out of the atmosphere. The contamination of soils in areas with a high population density and much industry is considerably higher than in other areas. A simulation model was developed to descsribe the Hg fall out drain rate.--Copyright 1975, Biological Abstracts, Inc.
W76-07450

5C. Effects Of Pollution

A METHOD FOR MONITORING EUTROPHICATION IN RIVERS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5A.
W76-06803

COMPARATIVE STUDIES OF SOME INLAND SALINE AQUATIC ECOSYSTEMS IN NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W76-06805

THE SUBMERSED MACROPHYTES OF THE PAMLICO RIVER ESTUARY, NORTH CAROLINA,
East Carolina Univ., Greenville, N. C. Dept. of Biology.
G. J. Davis, and M. M. Brinson.
North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Report No. 112, March 1976. 202 p, 40 fig, 35 tab, 104 ref. OWRT A-077-NC (4) 14-31-0001-5033.

Descriptors: *Aquatic plants, *Rooted aquatic plants, Aquatic population, Plant morphology, Aquatic weeds, Submerged plants, Plant growth, Nutrients, Nitrogen, Phosphorus, *North Carolina, Distribution, Biomass, Algae, *Rhodophyta.
Identifiers: *Pamlico River Estuary(NC), *Macrophytes, *Vallisneria Americana.

The ecology of the submersed aquatic macrophytes (including filamentous algae) of the Pamlico River NC estuary was studied from the summer of 1973 through the summer of 1975. Rooted macrophytes were not found in the lower half of the estuary proper. The distribution and biomass of the plants were an expression of physical factors associated with the morphology of a shallow turbid coastal plain estuary in a temperate region along with the inherent variability of the species present. Nutrients, at least N and P, did not appear to limit distribution. Phosphate is extremely high in this estuary, partly in association with a phosphate mine on the south shore. Biomass was estimated with aerial photography and ground truth studies. Vallisneria americana was the dominant rooted macrophyte, comprising 85% or more of the rooted biomass. This species turns over in biomass several times a year as leaves continually die and are lost. The red alga, Compsopogon coeruleus, accounted for most of the total biomass in 1973 and 1974 but was sparse in 1975. In situ mesh bag experiments indicated rapid decay of macrophytes with the half-life of organic dry weight being less than two weeks in the summer. (Stewart-North Carolina State)
W76-06809

RADIOECOLOGY OF WATER ORGANISMS, VOL. 2. DISTRIBUTION AND MIGRATION OF RADIONUCLIDES IN FRESHWATER AND SEAWATER BIOCENOSES.
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5B.
W76-06861

STUDY OF SR90/SR RATIO IN A LATVIAN SEASIDE LAKE,
Akademiya Nauk Latviiskoi SSE, Riga. Inst. of Biology.
M. P. Leinerte, D. R. Vadzis, Z. K. Kalninya, and Y. Sloka.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 43-48, 3 fig, 1 tab, 10 ref.

Descriptors: *Radioecology, *Strontium, *Strontium radioisotopes, Water pollution effects, Plankton, Benthos, Fish, Aquatic life, Bottom sediments, Migration, Eutrophication.
Identifiers: *Accumulation coefficients.

Comparisons were made between Sr90 and stable Sr in water, plankton, macrozoobenthos, macrophytes, fish and bottom soils of an ultraeutrophic lake. A direct dependence existed between the amount of stable Sr and Sr90; the greater the amount of Sr90 in the object, the greater the amount of stable Sr it contains and vice versa. The discrepancy between the content of radioactive and stable Sr in hydrobionts increases during the vegetative period. (See also W76-06861) (Chilton-ORNL)
W76-06869

SR90/SR RATIO IN PLANKTON OF LATVIAN LAKES OF VARIOUS TYPES,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
S. K. Kalninya.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuelides in Freshwater and Seawater Biocenoses, 1973. p 49-52, 2 fig, 1 tab, 2 ref.

Descriptors: *Radioecology, *Strontium, *Strontium radioisotopes, Water pollution effects, *Plankton, Trophic levels, Lakes.

Comparison of the specific activity of Sr in plankton and in water showed that activity of Sr was higher in water in all cases. The greatest difference was observed for the eutrophic and mesotrophic lakes (3.6 times) and the smallest difference for the dystrophic (2.1 times) and ultraeutrophic (2.6 times) lakes. With respect to the values of specific activity in plankton and in water, lakes of various trophic levels were in the following decreasing sequence: dystrophic, eutrophic, mesotrophic, and ultraeutrophic. (See also W76-06861) (Chilton-ORNL)
W76-06870

RATIO BETWEEN CS137 AND K ACCUMULATION COEFFICIENTS IN FRESHWATER ORGANISMS,
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii
A. A. Solyus.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 62-65, 2 tab, 7 ref.

Descriptors: *Radioecology, *Cesium, *Potassium, *Aquatic life, Food chains, Radioisotopes, Freshwater, Lakes, Absorption.
Identifiers: *Accumulation coefficients.

From the determination of the ratio of the accumulation coefficient of Cs137 to the accumulation coefficient of potassium in aquatic life from nine lakes, it was established that this observed ratio did not depend on the concentration of potassium in the water of freshwater lakes. The primary factor for determining the observed ratio value is the composition of the food. This indicates the possibility of using this characteristic not only for studying the processes of accumulation of radiocesium, but also as an indicator of food interrelations among hydrobionts. (See also W76-06861) (Chilton-ORNL)
W76-06873

ENVIRONMENTAL NA22 IN FRESHWATER ECOSYSTEM STUDIES,
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
D. G. Fleishman, and Y. N. Kanevskii.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 66-69, 1 tab, 1 fig, 6 ref.

Descriptors: *Radioecology, *Sodium, *Ecosystems, Freshwater, Sea water, Habitats, Lampreys, Smelts, Salmon, Lakes, Radioisotopes, Rivers.
Identifiers: *Specific activity, Half-life.

The content of Na22 and specific activity of sodium in some lakes and rivers of the USSR were studied in 1968-1971. Substantial differences in the values of specific activity of sodium between marine and freshwater systems were found which made it possible to study the exchange of sodium between migratory fish and lampreys and the environment. The exchange of sodium in Pacific salmon, smelt and lampreys progresses via nonalimentary routes and the value of specific activity of sodium in them becomes equal to the value in their habitat after two or three months in freshwater. The values of sodium biological half-life estimated for these animals was 15-30 days. (See also W76-06861) (Chilton-ORNL)
W76-06874

ON ACCUMULATION OF SR90 AND CS137 BY SOME FISH SPECIES IN FRESHWATER RESERVOIRS,
Kazan Inst. of Biology (USSR).
B. I. Bragin, and S. A. Matmuratov.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 74-77, 1 tab, 4 ref.

Descriptors: *Radioecology, *Strontium, *Strontium radiosisotopes, *Cesium, Fish, Freshwater, Reservoirs, Calcium, Potassium, Fish diets.

Seven species of fish from reservoirs with mineralization ranging from 1058-5450 mg/l, potassium concentrations ranging from 15-110 mg/l, and calcium concentrations from 20-40 mg/l were studied. Sr90 and Cs137 accumulation in the fish was determined. The data indicated that K concentrations in muscular tissues and Ca in bone tissues of the fish are practically constant and do not depend on their content in the water while the content of Cs137 and Sr90 in these tissues of all fish depends on the concentration of K and Ca in the water. The data also showed the connection of the differences in the accumulation of radionuclides with the nature of the diet of fishes. (See also W76-06861) (Chilton-ORNL)
W76-06876

K, RB, AND CS EXCHANGE DYNAMICS IN FISH AND LAMPREY MIGRATING FROM SEA TO FRESH WATER (BEFORE SPAWNING),
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
Y. P. Kaneviskii.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 78-81, 1 fig, 1 tab, 9 ref.

Descriptors: *Radioecology, *Fish migration, *Potassium, *Rubidium, *Cesium, Freshwater, Sea water, Fish, *Lampreys, Smelts.

Migratory smelt and lampreys do not eat during their stay in fresh water in the prespawning period. For this reason they were chosen to study the change in K, Rb, and Cs concentrations in order to understand the role of nonalimentary routes of entry of these elements into the organism. The data indicated no increase in the concentrations and that these elements do not enter the organisms or migrating animals when they are in freshwater. (See also W76-06861) (Chilton-ORNL)
W76-06877

THE ROLE OF WATER AND FOOD IN THE UPTAKE OF CS137 BY FISH ORGANISMS,
Ministerstvo Zdravookhraneniya S. S. S. R. Moscow. Institut Biofiziki.
A. G. Pakulo.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 82-84, 1 tab, 6 ref.

Descriptors: *Radioecology, *Cesium, Food, Fish, Laboratory tests, *Absorption, Fish food organisms.

Comparisons were made between fish receiving food contaminated with Cs137, fish inhabiting water contaminated with Cs137 but with no food contamination, and fish inhabiting contaminated water and receiving contaminated food. The maximum uptake of Cs137 by fish organisms occurred with water and food. With equal concentrations of nuclide in water and food, the bulk of Cs137 entered the fish from the water. (See also W76-06861) (Chilton-ORNL)
W76-06878

ON THE ROLE OF THE ALIMENTARY ROUTE IN CS137 ACCUMULATION BY GUDGEON,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliningrad (USSR).
A. A. Stepin.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 89-91, 1 tab, 10 ref.

Descriptors: *Radioecology, *Cesium, *Absorption, Fish, Food, Laboratory tests.
Identifiers: *Gudgeons.

Comparisons were made of the Cs137 uptake of gudgeons living in uncontaminated water but being fed contaminated food, gudgeons living in contaminated water and being fed uncontaminated food, and gudgeons living in contaminated water and being fed contaminated food. The data showed that absorption through the skin and the gill apparatus should be considered as the main route of Cs137 entrance into the gudgeon organism. (See also W76-06861) (Chilton-ORNL)
W76-06880

UPTAKE OF SR90 BY ORGANISMS OF GAMMARUS SP AND CHIRONOMUS F. L. PLUMOSUS L.,
Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of Botany.
D. P. Marchyulenene, N. K. Shtryupkuvene, and G. G. Polikarpov.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, (1973). p, 92-95, 3 fig, 1 tab, 3 ref.

Descriptors: *Radioecology, *Strontium, *Absorption, Aquatic animals, *Crustaceans, *Diptera, Insects, Food.

The study established that the crustacean, Gammarus Sp, accumulated Sr90 in greater quantities than did the insect, chironomid larvae. The data also showed that the Sr90 enters the organisms in greater amounts from water than from radioactive food. (See also W76-06861) (Chilton-ORNL)
W76-06881

DIFFERENCES IN THE SPECIFIC ACTIVITY OF CS137 IN THE COMPONENTS OF A FRESHWATER ECOSYSTEM,
Akademiya Nauk SSSR, Moscow. Inst. of Evolutionary Physiology.
D. G. Fleishman, Y. P. Kanevskii, and A. A. Solyus.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, (1973). p 96-100, 2 fig, 1 tab, 8 ref.

Descriptors: *Radioecology, *Cesium, *Food chains, *Radioisotopes, Freshwater, Fish, Ecosystems, Aquatic organisms.

Differences in the accumulation of Cs137 and Cs by freshwater organisms was explained on the concept that Cs does not enter the organisms directly from water, but from food. Therefore, the specific activity of Cs in fish must be the same as in their food, but may not coincide with specific activity of the nuclide in lake water if the ecosystem has a Cs source with a Cs137/Cs value different from water which is accessible for assimilation by the aquatic organisms. Significant differences in the accumulation of Cs137 and Cs were found only in the aquatic organisms connected with the benthos food chain. (See also W76-06861) (Chilton-ORNL)
W76-06882

MIGRATION OF SR90 FROM FISH ORGANISMS INTO OFFSPRINGS,
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
V. G. Kulikova, and N. V. Kulikov.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, (1973). p 101-104, 2 fig, 1 tab, 3 ref.

Descriptors: *Radioecology, *Strontium, *Fish eggs, Fish, Embryonic growth stage, Migration.

Female guppies and paradise fish were used to study the dynamics of Sr90 accumulation in various organs and tissues of fish with consideration for the accumulation in the forming eggs and embryos. The highest accumulation coefficients of the radionuclide were found in skeletal formations and the lowest were found in soft tissues. Maximum accumulation coefficients in the eggs of the paradise fish were expressed in decimal fractions, while they were higher by almost two orders in the eggs of the guppies. The removal of Sr90 from fish organisms was determined by the degree of the development of the eggs, the concentration of the radionuclide in the eggs, and by the mass of sexual products in the organism. (See also W76-06861) (Chilton-ORNL)
W76-06883

THE ROLE OF FRESHWATER FISH AS A POSSIBLE SUPPLIER OF P32 UNDER THE CONDITIONS OF POLLUTION OF NATURAL WATER RESERVOIRS BY THIS RADIONUCLIDE,
Ministerstvo Zdravookhraneniya S.S.S.R., Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5B.
W76-06884

BIOLOGICAL EFFECTS OF RU106 AND J131 ON WATER ORGANISMS,
Nauchno-Issledovatelskii Institut Radiatsionnoi Gigieny, Leningrad (USSR).
V. N. Gus'kova, N. I. Mashneva, L. F. Rodionova, V. M. Kupriyanova, and A. A. Zasedatelev.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, (1973). p 110-114, 3 tab, 8 ref.

Descriptors: *Radioecology, *Radioisotopes, *Radioactivity effects, *Environmental effects, Aquatic life, Plankton, Fish, Larvae, Iodine, Rubidium, *Water pollution effects.
Identifiers: *Accumulation coefficients.

The purpose of this work was to carry out studies on the effects of J131 and Ru + Rh106 on the viability of a water reservoir as a whole and some biological components under the conditions of a single contamination within a range of concentrations of from 10 to the minus 8th power to 0.01 curie/liter. Some biological effects by these radionuclides were found in a concentration of 0.001 to 0.00001 curie/liter. Lower concentrations were found to be harmless. It was established that the intensity and value of accumulation depended on the organization stage of the hydrobiont. The highest accumulation coefficients were observed in the simplest organisms and the lowest coefficients were found for eggs, larvae and adult fish. (See also W76-06861) (Chilton-ORNL)
W76-06885

ACCUMULATION OF CS137 BY INDUSTRIAL FISH SPECIES IN THE CASPLAN SEA,
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
N. A. Bakunov, A. P. Panarin, and L. V. Fedotova.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, (1973). p 136-139, 2 fig, 5 ref.

Descriptors: *Radioecology, *Fish, Strontium, Cesium, Seawater, Freshwater, *Absorption.
Identifiers: *Accumulation coefficients, Volga Delta, *Caspian Sea.

Concentrations of Cs137 are expressed by values of one order from 53 to 87 picocurie/kg which were the representative concentrations found in the anchovylike sprat. Clearly expressed differences were found in the accumulation of Cs137 by marine and freshwater fishes. Concentrations of Cs137 in freshwater fishes of the Volga Delta in 1969 were somewhat lower than in sea fishes of the Caspian Sea. (See also W76-06861) (Chilton-ORNL)

W76-06891

MECHANISMS OF ACCUMULATION OF RADIOACTIVE AND STABLE SR BY NORTHERN MARINE ALGAE UNDER NATURAL AND EXPERIMENTAL CONDITIONS,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliingrad (USSR).
V. S. Zlobin.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p140-143, 1 tab, 1 fig, 9 ref.

Descriptors: *Radioecology, *Strontium, *Algae, Aquatic algae, Sorption, Salinity, Absorption, Oceans.
Identifiers: *Accumulation coefficients, *Barents Sea.

Studies on algae growing in the coastal regions of the Barents Sea showed that the content of Sr90 in macrophytes varied from 0.53 to 14.00 times 10 to the minus 11th power curie/kg of wet weight, and accumulation coefficients varied from 14 to 4830, constituting on the average 386 + 275 (n=12). The accumulation coefficient of stable Sr in Fucus vesiculosus and Ascophyllum nodosum changed depending on the salinity. Strontium sorption on the surface of algae is the basis of its accumulation in the tissues. (See also W76-06861) (Chilton-ORNL)
W76-06892

COMPARATIVE EVALUATION OF THE ACCUMULATION DYNAMICS OF SOME CORROSION AND FISSION GROUP RADIONUCLIDES AND ALPHA EMITTERS BY NORTHERN MARINE ALGAE,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliningrad (USSR).
V. S. Zlobin.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 144-147, 2 fig, 13 ref.

Descriptors: *Radioecology, *Radioisotopes, *Marine algae, Cesium, Rubidium, Rhodium. Uranium, Polonium, Plutonium, Cobalt, Iron, Manganese, *Absorption.
Identifiers: *Accumulation coefficients.

Accumulation coefficients of Co., Fe, Mn, Cs137, Y91, Ru106 + Rh106, U, Po210, and Pu239 were studied in brown algae. It was found that the application of inhibitors and stimulators of cell respiration showed a dependence of the accumultion of colloidal particles and Pu239 on the point of damage in the system of cytochromes and the degree of interest on the part of the energy system of the plant cell. The variation limits of the accumulation of Pu239 were from 136 to 38%. (See also W76-06861) (Chilton-ORNL)
W76-06893

RADIOACTIVE CONTAMINATION OF COMMERCIAL HYDROBIONTS OF THE WESTERN BASIN,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kainingrad (USSR).
N. P. Prokhorycheva.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater ad Seawater Biocenoses, 1973. p 148-152, 2 tab, 4 ref.

Descriptors: *Radioecology, *Strontium, *Cesium, Radioisotopes, Fish, Oceans, Absorption.
Identifiers: Baltic Sea, North Sea.

Data showed an increase in the concentration of Sr90 in the bone tissues of herring, cod and haddock caught in the Baltic and North seas in 1968-1971. Cartilaginous fishes showed no increase of Sr90 concentrations. The concentration of Cs137 in muscle tissues of cod and flounder caught in the Baltic Sea between 1969 and 1971 decreased noticeably. On this basis, it was established that there was no clear dependence of the accumulation intensity on the nature of feeding. (See also W76-06861) (Chilton-ORNL)
W76-06894

RADIOECOLOGICAL CONCENTRATION PROCESSES IN THE WATER-FISH LINE,
Scientific Research Inst. of Radiation Hygiene, Leningrad (USSR).
L. A. Teplykh.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Bioncenoses, 1973. p 153-156, 4 tab, 2 ref.

Descriptors: *Radioecology, *Radioisotopes, *Fish, Polonium, Absorption.

The study established that Po210 is the basic dose-forming isotope in fishes. Among the studied organs and tissues of fishes, the highest concentrations of Po210 were found in the liver, spawn and milt. Concentratins of K, Pb210, Po210, Ra226, and Th228 in sea water and tissues of commercial fishes were determined in the study. (See also W76-06861) (Chilton-ORNL)
W76-06895

ACCUMULATION OF SR90, CA, AND SR BY FISH IN SEAS AND OCEANS,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
V. P. Shvedov, G. G. Polikarpov, and I. A. Skolova.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 157-159, 1 tab.

Descriptors: *Radioecology, *Strontium, Calcium, *Fish, *Oceans, *Absorption.
Identifiers: *Accumulation coefficients.

The values of Sr90 accumulation coefficients and those of stable Ca and Sr differ, which indicates the peculiarities of their selective absorption. The accumulation coefficients of Sr90 depend chiefly on the fish species and the salinity, temperature and presence of nutrients in the water. (See also W76-06861) (Chilton-ORNL)
W76-06896

ACCUMULATION OF RADIOACTIVE AND STABLE ZINC BY BLACK SEA ALGAE CYSTOSEIRA BARBATA AND ULVA RIGIDA,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
L. I. Rozhanskaya.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 160-162, 1 fig, 5 ref.

Descriptors: *Radioecology, *Zinc, *Algae, Absorption.
Identifiers: *Accumulation coefficients, *Cystoseira barbata, *Ulva rigida, *Black Sea.

The data showed that the accumulation coefficients of Zn65 for the two species of algae were 2-3 times smaller than the corresponding accumulation coefficients of stable zinc. According to the obtained data, calculations of the specific activity of zinc show that it is less than one in all instances. This can testify to weak exchange of zinc in macrophyte structures. (See also W76-06861) (Chilton-ORNL)
W76-06897

ON TH234 ACCUMULATION BY MARINE ORGANISMS,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
A. Y. Zesenko, and A. B. Nazarov.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 163-166, 1 fig, 13 ref.

Descriptors: *Radioecology, *Thorium, Algae, *Phytoplankton, *Marine algae, *Absorption.
Identifiers: *Accumulation coefficients, Ulva rigida, Entermorpha linza, Cystoseira barbata.

Maximum accumulation coefficients of Th234 for the algae were established as reaching 1200, 700, and 60 for Ulva rigida, Enteromorpha linza, and Cystoseira barbata, respectively. The maximum accumulation coefficient of Th234 was reached by phytoplankton at 20,000. It was determined that marine organisms play a considerable role in shifting the radioactive equilibrium of U/Th in sea water. (See also W76-06861) (Chilton-ORNL)
W76-06898

MATHEMATICAL MODEL OF SR90 EXCHANGE BETWEEN CYSTOSEIRA AND MARINE WATER,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
V. N. Egorov, and L. G. Kulebakina.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 167-169, 2 fig, 3 ref.

Descriptors: *Radioecology, *Mathematical models, *Strontium, Algae, *Marine algae, Metabolism.
Identifiers: *Cystoseira.

A mathematical model of nuclidic exchange was constructed using the concept of metabolism in the system Sr90 in marine water--Cystoseira as a chamber structure. The model described its dynamics and made it possible to interpret the concentration phases biophysically. (See also W76-06861) (Chilton-ORNL)
W76-06899

RADIOECOLOGO-BIOCHEMICAL APPROACH TO THE STUDY OF THE COBALAMINE CYCLE IN THE OCEAN,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
A. G. Benzhitskii.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 170-173, 2 tab, 13 ref.

Descriptors: *Radioecology, Cobalt, *Cobalt radioisotopes, *Marine microorganisms, Oceans, Absorption, Marine animals.
Identifiers: *Cobalamines.

Marine organisms extract cobalt, its artificial radionuclides and cobalamines from sea water. The transition of mineral cobalt into the form of vitamin B12 increases its migration abilities. Inclusion of atoms of cobalt radionuclides into a molecule of vitamin B12 may have greater consequences for the organism than an external irradiation with gamma-quanta equal with respect to the forming doses. (See also W76-06861) (Chilton-ORNL)
W76-06900

THE ROLE OF SOME POLYSACCHARIDES OF BROWN ALGAE IN THE EXTRACTION OF SR90 FROM SEA WATER,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
D. D. Ryndina.

In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. 174-175, 3 ref.

Descriptors: *Radioecology, *Strontium, Algae, Sorption, Sea water, *Phaeophyta, *Marine algae.
Identifiers: *Polysaccharides, Cystoseira.

Experiments were done on live and dead specimens of algae containing arious polysaccharides (alginic acids, fucoidan, and 'aluglose'), as well as on individual carbohydrates isolated from the organisms. It was found that Sr90 was extracted most readily from sea water by hydrobionts which contained all polysaccharides. Accumulation coefficients of Sr90 decreased during decomposition of Cystoseira and the formation of detritus due to the changes in the sorption properties of alginic acids with the change of pH of intracellular solutions. (See also W76-06861) (Chilton-ORNL).
W76-06901

INVESTIGATIONS ON THE ADSORPTION OF CO60 AND CS137 ON SURFACES OF BROWN ALGAE AND GLASS UNDER EXPERIMENTAL CONDITIONS,
Atlantic Scientific Research Inst. of Fisheries and Oceanography, Kaliningrad (USSR).
N. I. Buyanov.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 176-179, 3 fig, 7 ref.

Descriptors: *Radioecology, *Adsorption, Surfaces, Cesium, Cobalt, Algae, *Phaeophyta.

Identical nuclide concentrations (0.000001 curie/liter) of Cs137 andCo60 were used in the experiments. Glass plates were placed into the solutions simultaneously with the algae. Accumulation of Co60 and Cs137 by the Algae had a common regularity with the increase in the radioactivity of the glass plates. These experiments confirms the assumption that a considerable role in the accumulation of radionuclides by algae is played by the processes of their adsorption on the surface. (See also W76-06861) (Chilton-ORNL)
W76-06902

INFLUENCE OF SALINITY AND CONCENTRATION OF SR AND CA IN WATER ON THE SR90 ACCUMULATION BY CYSTOSEIRA,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
L. G. Kulebakina, and D. S. Parchevakaya.
In: Radioecology of Water Organisms, Vol. 2. Distribution and Migration of Radionuclides in Freshwater and Seawater Biocenoses, 1973. p 180-182, 1 tab, 11 ref.

Descriptors: *Radioecology, *Salinity, Algae, Strontium, Calcium, Sea water, *Marine algae, Absorption.
Identifiers: *Accumulation coefficients, *Cystoseira.

Salinity was found to be the strongest factor affecting the accumulation coefficient of Sr90. On the basis of obtained data, it was concluded that when salinity changes, the accumulation coefficients do not change as much because of changes in the concentration of isotopic or nonisotopic carriers such as strontium, calcium as under the effect of the overall salinity of a medium affecting the functional state of the organism. (See also W76-06861) (Chilton-ORNL)
W76-06903

WATER QUALITY IN VICINITY OF FENTON HILL SITE, 1974,
Los Alamos Scientific Lab., N.Mex.
For primary bibliographic entry see Field 5B.
W76-06909

A METHODOLOGY FOR IMPACT ASSESSMENT IN THE ESTUARINE/MARINE ENVIRONMENT,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6G.
W76-06910

SELECTED BIBLIOGRAPHY OF TERRESTRIAL, FRESHWATER, AND MARINE RADIATION ECOLOGY,
Washington State Univ., Pullman. Dept. of Zoology.
V. Schultz, and F. W. Whicker.
Available from the National Technical Information Service, Springfield, Va. 22161 as TID-25650 $7.50 in paper copy, $2.25 in microfiche. Report TID-25650-S1, 1975, 240 p.

Descriptors: *Bibliographies, *Radioecology, *Radioactivity effects, *Radioisotopes, Freshwater, Terrestrial habitats, Marine biology, Estuarine environment, Ecology, Environmental effects, Watr pollution effects.

This is a supplement of over 2,000 references to an original bibliography published in 1971 on literature related to a radiation ecology. In general a reference is included in only one subject category. No abstracts are included. In compiling the list an attempt was made to provide complete information concerning each reference without excessive library search. When known, each reference is followed with its Nuclear Science Abstract designation. Subjects included are: status and needs of radiation ecology; environmental radioactivity; radionuclide concentration; ionizing radiation effects, techniques and measurement; peaceful uses of atomic energy; waste disposal; nuclear testing and consequences; glossaries, standards and licensing procedures. (See also W75-09891, W73-07962, W72-04452, and W71-09232), (Chilton-ORNL)
W76-06913

WATER RESOURCES PROBLEMS AND SOLUTIONS ASSOCIATED WITH THE NEW LEAD BELT OF S.E. MISSOURI,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 5G.
W76-06948

COAL MINING AND ITS EFFECT ON WATER QUALITY,
Ohio Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-06950

THE IDEFJORD: A DESTROYED MARINE ENVIRONMENT, (IN SWEDISH),
For primary bibliographic entry see Field 5B.
W76-06988

MODEL ECOSYSTEM STUDIES OF LEAD AND CADMIUM AND OF URBAN SEWAGE SLUDGE CONTAINING THESE ELEMENTS,
Illinois Univ. at Urbana-Champaign. Dept. of Entomolygy.
P-Y. Lu, R. L. Metcalf, R. Furman, R. Vogel, and J. Hassett.
Journal of Environmental Quality, Vol. 4, No. 4, p 505-509, October/December, 1975. 2 fig, 5 tab, 20 ref.

Descriptors: *Model studies, *Laboratory investigations, *Lead, *Cadmium, *Sewage sludge, *Heavy metals, Metals, Soils, Agriculture, Crops, Ecosystems, Sludge disposal, Water pollution effects.
Identifiers: *Land application.

A laboratory model ecosystem was constructed to investigate the environmental fate of lead from lead chloride and cadmium from cadmium chloride by direct application of two types of soils or by using sewage sludge as the source of heavy metals. The model used a terrestrial/aquatic interface with silica sand, Bloomfield soil (sandy loam) and Drummer soil (silty clay loam) as substrates. Applications of lead, cadmium, and sewage sludge were made directly to the substrates. Lead and cadmium were mobilized and incorporated into the food chain organisms in proportion to the sorption capacity of the substrate and were highest in silica sand and lowest in the Drummer soil. With sewage sludge application, there was a significant mobilization and transfer of cadmium, copper, lead and zinc into the food chains of alga, daphnia, mosquito larva, snail, and fish. Cadmium in particular had a negative effect on various organisms in the model ecosystem. It was suggested that if urban sewage sludge is to be applied to croplands, steps to prevent the sludge from trace metals contamination should be taken. (Kramer-FIRL)
W76-07013

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: FERNOW EXPERIMENTAL FOREST, W. VIRGINIA,
Forest Service (USDA), Parsons, W. Va. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W76-07021

DISTRIBUTION OF BDELLOVIBRIO BACTERIOVORUS IN SURFACE WATERS AND ITS ROLE IN SELF-PURIFICATION PROCESSES, (IN RUSSIAN),
Kuybyshevskii Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny (USSR).
For primary bibliographic entry see Field 5B.
W76-07024

AEROBIC PHOTODEGRADATION OF FE(III)--ETHYLENEDINEITRILO)TETRAACETATE (FERRIC EDTA): IMPLICATIONS FOR NATURAL WATERS,
Eastman Kodak Co., Rochester, N.Y. Health and Safety Lab.
H. B. Lockhart, and R. V. Blakeley.
Environmental Science and Technology, Vol. 9, No. 12, p. 1035-1038, 1975. 7 fig., 1 tab., 13 ref.

Descriptors: *Iron, *Irradiation, *Degradation(Decomposition), Chemical reactions, Nitrilotriacetic acid, Chelation, Hydrogen ion concentration, Biodegradation, Photosynthesis.
Identifiers: *Photodegradation, Photolysis.

Fe(III)-(ethylenedinitrilo)tetraacetate (ferric EDTA) which is used in photographic processing solutions and fertilizers, may be reaching the environment. It is a thermodynamically stable chelate. Its removal from the environment by interaction with sunlight (Photodegradation) was studied by the behavior of aqueous solutions of 1-C14-ferric EDTA at pH 4.5, 6.9, and 8.5 when irradiated. Carbon dioxide, formaldehyde, N-carboxymethyl-N, N'-ethylene-diglycine, N,N'-ethylenediglycine, iminodiacetic acid, N-carboxymethyl-N-aminoethyleneglycine, N-aminoethyleneglycine, and glycine were identified as the major photodegradation products. Nitrilotriacetic acid was not detected. The photolysis rate was pH dependent; it was most rapid at pH 4.5. With a light intensity of 4000-ft candles and an initial concentration of 0.0006 M, ferric EDTA removal was complete after 24 hours of irradiation at pH 4.5 or 6.9 and after 32 hours at pH 8.5. The results showed a significant photosensitivity over the pH range of natural waters. Possible schemes for photodegradation of ferric EDTA at pH 4.5 and pH 6.9-8.5 are suggested, based on the time various photodegradation products were first detected and their relative concentrations. Photodegradation may play a significant role in the removal of ferric EDTA from natural waters. Fer-

ric EDTA biodegradation and interaction with suspended matter and sediments may also affect the ferric EDTA concentration and removal rate. (Buchanan-Davidson--Wisconsin)
W76-07096

STUDIES ON METABOLIC ACTIVITY OF PLANKTONIC BACTERIA ISOLATED FROM THREE LAKES,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
E. Strzelczyk, M. Stopinski, and W. Donderski.
Acta Microbiologica Polonica, Ser. B., Vol. 7, No. 3, p. 177-183, 1975.

Descriptors: *Metabolism, *Bacteria, *Lakes, Respiration, Carbohydrates, Amino acids, Trophic level, Organic matter, Europe, *Eutrophication, Plankton.
Identifiers: Lake Jeziorak(Poland), Lake Tynwald(Poland), Lake Jasne(Poland), Glucose, Arabinose, Xylose, Fructose, Ribose, Maltose, Cellobiose, Starch, *Poland.

Bacteria were studied on nine substrates which occur naturally. Of 480 strains isolated from three Polish lakes, all except one used casamino acids. Amino acids were less important for planktonic bacteria from mesotrophic than from eutrophic lakes inasmuch as eutrophic lakes favored development of algae and vascular plants which excreted amino acids. More planktonic than benthic bacteria used amino acids and metabolized them more rapidly. Glucose was the most frequently attacked carbohydrate. More bacteria unable to utilize carbohydrates were found in all lakes in January and April, and fewer in August and October. Arabinose and xylose were the least readily utilized. Glucose and fructose were attacked by more benthic than planktonic bacteria, but benthic bacteria were metabolically less active. More planktonic bacteria could use arabinose, ribose, maltose, cellobiose, and starch. The metabolic activities and abilities of bacteria to use carbon and energy sources depended on time of isolation and varied in the different lakes. Water and bottom deposits from lakes of different trophic states contained bacteria with different metabolic activities which could attack different organic substances. The number of organisms in water and mud varied seasonally. (Buchanan-Davidson--Wisconsin)
W76-07097

PHOSPHATE, SILICATE, NITRATE, AND AMMONIA IN LINDASPOLLENE, A NORWEGIAN LAND-LOCKED FJORD,
Bergen Univ. (Norway). Biological Station.
For primary bibliographic entry see Field 5B.
W76-07098

FIELD STUDIES ON OZONE INACTIVATION OF A GYMNODINIUM BREVE TOXIN,
National Marine Fisheries Service, Milford, Conn. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5G.
W76-07099

THE ENVIRONMENTAL IMPACT OF FERTILIZERS,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 5B.
W76-07100

EFFECT OF ANAEROBIC CONDITIONS IN BOTTOM WATERS ON THE OCCURRENCE OF RED TIDES AT OMURA BAY,
Nagasaki Univ. (Japan). Faculty of Fisheries.
K. Hirayama, and S. Iizuka.
Environmental Letters, Vol. 9, No. 2, p. 167-178, 1975. 3 fig., 16 ref.

Descriptors: *Hypolimnion, *Gymnodinium, *Anaerobic conditions, *Red tide, Dinoflagellates, Algae, Sea water, Bottom sediments, Nutrients, Asia.
Identifiers: *Omura Bay(Japan).

Gymnodinium red tides in Omura Bay, Japan, occur in July after the rainy season before the bottom in the center of the bay becomes anoxic; the plankton initially grow at the surface of branch inlets. Red tides also occur in September when anoxic conditions develop in bottom water in the center of the bay; the dinoflagellates grow initially in bottom or middle layers around oxygen-depleted water. The relation of anoxic bottom water to red tide development was investigated. Unenriched sea water collected in early July before oxygen deficiency had developed couldn't support Gymnodinium growth. They grew more in sea water collected from late July to late August when bottom waters were becoming anaerobic. Growth occurred in sea water collected early in July if inorganic nutrients were added. When all nutrients in Wilson-Collier medium were added, growth was higher than in cultures with added inorganic nutrients only. An increased supply of inorganic nutrients to sea water was needed to develop a red tide. These nutrients originated in bottom mud under anaerobic conditions. Development of oxygen deficiency in bottom waters makes the environment favorable for growth of Gymnodinium by supplying inorganic nutrients and other unknown stimulants from bottom mud. (Buchanan-Davidson--Wisconsin).
W76-07101

ZOOPLANKTON DIVERSITY IN FOUR NORWEGIAN FJORDS,
Trondheim Univ. (Norway). Biological Station.
T. Stromgren.
Sarsia, Vol. 59, p. 15-30, 1975. 4 fig., 7 tab., 30 ref.

Descriptors: Zooplankton, *Fjords, *Correlation analysis, Copepods, Depth, Seasonal, Spatial distribution, Discharge(Water), Estuarine environment, Inflow, Dominant organisms, Europe.
Identifiers: *Zooplankton diversity, Diversity indices, Shannon-Wiener index, Simpson index, Margalef index, *Norway.

Seasonal and spatial differences in zooplankton diversity were studied in four Norwegian fjords which differed in latitude, topography, hydrography, and hydroclimatic conditions, but similar compositions. Correlations between Shannon-Wiener and Simpson indices and between the Simpson index for copepods and holoplankton were found but there were discrepancies with Margalef's index, especially in the upper 100 meters. Increases in diversity at 1-100 meters and decreases in deeper layers in Trd, coinciding with spawning of Calanus finmarchicus and outflow in upper layers. There was an increase in Simpson's index for copepods outwards in the upper 100 meters in Hardangerfjorden, Trodhondheimsfjorden and Skjomen were observed, coinciding with spawning of Calanus finmarchicus and outflow in upper layers. There was an increase in Simpson's index for copepods outwards in the upper 100 meters in Hardangerfjorden, Trondheimsfjorden, and Skjomen in October-June, related to increasing estuarine conditions toward their centers. Similar correlations for July-September showed an opposite pattern in Trondheimsfjorden and Skjomen with decreasing diversity otwards related to coastal water inflow. Below 100 meters divesity decreased toward the outer parts of Trondheimsfjorden, possible due to deep inflows which may be related to reduced diversity. Diversity decreases from south-north were related to factors such as water exchange rates rather than factors associated with latitude. There was a negative correlation between average monthly diversity and standard deviation, indicating that a community with low diversity had the largest variations in diversity. (Buchanan-Davidson--Wisconsin).
W76-07102

AERATION AS A LAKE MANAGEMENT TECHNIQUE,
Wisconsin Dept. of Natural Resources, Madison.
S. A. Smith, D. R. Knauer, and T. L. Wirth.
Technical Bulletin No. 87, 1975. 40 p. 19 fig., 7 tab., 108 ref.

Descriptors: *Aeration, *Hypolimnion, *Lakes, *Eutrophication, *Management, Bubbles, Dissolved oxygen, Equipment, Design, Destratification, *Wisconsin, Thermal stratification, Nutrient removal, Seasonal, Anaerobic conditions.
Identifiers: *Lake rehabilitation, Mirror Lake(Wis), Larson Lake(Wis).

Feasibility of hypolimnetic aeration for lake restoration was demonstrated in two eutrophic Wisconsin lakes. Hypolimnetic aerators consisted of polyethylene tubes with internal twisted longitudinal plates. Compressed air or compressed air-liquid oxygen were supplied and water air-lifted through the tube to a bubble separation box at the surface. Bubble-free oxygenated water was returned to the hypolimnion. Osygen transfer from the compressor occurred in the bottom of the unit and the surface separation box. Total dissolved oxygen transfer efficiency was 20% with air and 23% with compressed air-liquid oxygen in Mirror Lake and 12-14% with air in Larson Lake. In summer both lakes had anoxic hypolimnia. Only Mirror Lake's high oxygen demand was not satisfied. Establishment of a cold water trout fishery in Larson Lake's hypolimnion appeared possible. Reliable oxygen uptake rate estimates are needed. Hypolimnetic aeration improved the dissolved oxygen without altering the thermal regime and eliminated rapid hypolimnetic nutrient recycling. In winter, hypolimnetic aeration improved dissolved oxygen conditions and had a positive effect on nutrients. In Mirror Lake total aeration in spring and fall supplemented hypolimnetic aeration. In Larson Lake, a depth-adjusted total aeration system plus hypolimnetic aeration may reduce the thickness of the anoxic metalimnion. (Buchanan-Davidson--Wisconsin).
W76-07103

NUTRIENTS AND PRIMARY PRODUCTION IN A WARM WATER STREAM,
Michigan State Univ., East Lansing. Inst. of Water Research.
M. L. Brehemer, R. C. Ball, and N. R. Kevern.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-242 113, $5.00 in paper copy, $2.25 in microfiche. Technical Report No. 4, Red Cedar River Series (MSU-IWR-TR-69-0004) September 1969. 89 p. 22 fig., 6 tab., 55 ref.

Descriptors: *Nutrients, *Primary productivity, *Rivers, *Periphyton, *Michigan, Dissolved oxygen, Water temperature, Hydrogen ion concentration, Aquatic plants, Phosphorus compounds, Nitrogen compounds, Nutrient removal, Sewage effluents, Chemical reactions, Chemical precipitation, Degradation(Decomposition), Plant pigments, Physical properties, Turbidity, Standing crops.
Identifiers: *Red Cedar River(Mich), Nutrient sources, Williamston(Mich), Warm-water stream.

Major nutrient sources and relationships between primary production and nutrient levels were studied in the Red Cedar River, Michigan. Dissolved nutrients varied with stream flow, water temperature, and primary production levels. The largest nutrient influx from tributary streams occurred shortly after a rainstorm and the concentration decreased rapidly suppressing aquatic flora activity; most nutrients were lost without producing a biological response. Most phosphorus and nitrogen came from municipal drains and sewage treatment plant effluents. Nutrients were removed by biological uptake, chemical adsorption, or precipitation within 0.6 mile downstream. Biologically combined phosphorus was released by periphyton decomposition when stream tempera-

tures were high and flow normal. The periphyton organic phosphorus to phytopigment ratio decreased with distance from outfall, indicating that the flora stored more than normal amounts of phosphorus. Normally periphyton production increased rapidly from ice cover to May, then decreased until winter, but production could be altered by annual rainfall. Biological responses to nutrients were greatest during high production periods and shifted downstream with increasing water temperature. Nitrogen limited periphyton production and caused dissolved phosphorus accumulation downstream. Adverse physical conditions (high stream flow and turbidity) can destroy the periphyton standing crop, but the flora was rapidly reestablished with normal stream conditions. (Buchanan-Davidson--Wisconsin).
W76-07104

THE EFFECT OF MICROORGANISMS ON PHYTOTOXICITY OF HERBICIDES. III. INTERACTION OF BACILLUS SP. 72 WITH VENZAR,
Wroclaw Univ. (Poland). Dept. of Microbiology.
N. Balicka, J. Lubczynska, and T. Wegrzyn.
Acta Microbiological Polonica, Ser. B, Vol.7, No. 3, p. 151-156, 1975. 5 fig., 6 ref.

Descriptors: *Microorganisms, *Herbicides, *Phytotoxicity, Pesticide toxicity, Phenols, Bacteria, Cultures, Chemical reactions, Ammonia, Hydrogen ion concentration, *Path of pollutants.
Identifiers: *Venzar, *Bacillus, *Flavonoids.

The interaction between the phenolic metabolites of Bacillus sp. 72 and the herbicide Venzar (3-cyclohexyl-5,6-trimethylenuracil) were studied. The interaction depended on the incubation conditions. Bacterial metabolic pathways differed in shaken and stationary cultures; growth rates did not vary, but production of ammonium ion and phenolic compounds reacting with the Folin reagent was higher in stationary cultures. The pH was about 7.0 in stationary cultures and 5.0 in shaken cultures, and their phenolic metabolites were different. The phenolic compounds produced by Bacillus sp. 72 were flavonoids which could change their chemical structure depending on aeration and hydrogen ion concentration. The ability of stationary cultures to increase Venzar phytotoxicity was greater than that of shaken cultures. Interactions between Venzar and the supernatants were observed. Venzar action appeared to depend on the ammonium ion concentration; when ammonia was evaporated, Venzar phytotoxicity decreased. Two flavonoids, separated by chromatography, interacted with Venzar and enhanced its phytotoxicity. When Venzar was added to cultures, it lost some of its activity after a six day incubation. When Sinapis alba was incubated with Venzar and bacteria, the bacteria appeared to reduce the herbicidal activity. (Buchanan-Davidson--Wisconsin).
W76-07105

INHIBITORS PRODUCED BY ALGAE AS AN ECOLOGICAL FACTOR AFFECTING BACTERIA IN WATER. II. ANTIBACTERIAL ACTIVITY OF ALGAE DURING BLOOMS,
Warsaw Univ. (Poland). Dept. of Environmental Microbiology.
R. J. Chrost.
Acta Microbiological Polonica, Ser. B, Vol. 7, No. 3, p. 167-176, 1975. 2 fig., 3 tab., 24 ref.

Descriptors: *Bactericides, *Algal toxins, *Plant growth substances, Bacteria, *Eutrophication, Peptides, Euphotic zone, Light penetration, Enteric bacteria, Extraction, Nuisance algae, Pyrrophyta, Cyanophyta, Oxygen requirements, Respiration, Microbial degradation, Inhibition.
Identifiers: *Gram positive bacteria, Bacillus subtilis, Staphylococcus aureus, Bacillariophyceae, Bacillus, Bacterium, Caccus.

Algal bactericidal exudates and their effects on biodegradation were investigated. During algal blooms Gram positive bacteria were eliminated, but generally Gram negative rods were unaffected (especially Pseudomonas and Enterobacteriaceae). Gram positive Bacillus subtilis and Staphylococcus aureus were the most sensitive to the effect of phytoplankton bloom extracts. Inhibition of bacterial growth by phytoplankton extracts (Bacillariophyceae, Pyrrophyta, and Cyanophyta) was stronger in the light than the dark. Little growth inhibition was observed in the light with Gram negative Pseudomonas II, Flavobacterium, and Achromobacter-Alcaligenes. Algal extracts reduced oxygen uptake of Gram positive bacteria partially in the dark but more so in the light. Gram negative bacteria were inhibited a little in the light. Pseudomonas IV and Enterobacteriaceae were resistant to algal toxins. The most active inhibitors of respiration were produced by blue-green algae. Many Gram negative bacteria resistant to algal extracts used more oxygen in samples with extracts than controls; a few exhibited inhibition of respiration. Lake water collected during a Microcystis bloom inhibited Bacillus subtilis, showing that algae excreted inhibitors during growth. Inhibition of organic matter decomposition by phytoplankton bloom extracts occurred in the euphotic zone, but not the profundal zone, indicating dependance on light. (Buchanan-Davidson--Wisconsin)
W76-07106

PROCESSES CONTROLLING THE DISSOLVED SILICA DISTRIBUTION IN SAN FRANCISCO BAY,
Geological Survey, Menlo Park, Calif.
D. H. Peterson, T. J. Conomos, W. W. Broenkow, and E. P. Scrivani.
Estuarine Research, Vol. 1, p. 153-187, 1975. 21 fig., 1 tab., 73 ref.

Descriptors: *Estuaries, *Silica, *Dissolved solids, *Bays, Spatial distribution, *California, Temporal distribution, Estuaries, Rivers, Mixing, Water circulation, Sea water, Inflow, Recycling, Phytoplankton, Salinity.
Identifiers: *San Francisco Bay(Calif), Sacramento River(Calif), San Joaquin River(Calif).

Relationships between seasonal dissolved silica variations and insolation and river discharge effects in the San Francisco Bay estuarine system were studied, especially longitudinal (river to ocean) dissolved silica variations associated with estuarine circulation. Dissolved silica is primarily supplied to the bay by river inflow and ocean water. Its distribution differs from that of phosphate, nitrate, and ammonia because human input and recycling by estuarine siliceous phytoplankton dissolution are minor dissolved silica sources. Variations in distribution are seasonal and related to variations in river supply and phytoplankton utilization. When the rate at which river inflow supplies silica to the bay is large compared to the rate silica is used in the estuary, the dissolved silica decrease as salinity increases is primarily controlled by mixing river and ocean waters. When dissolved silica utilization increases compared to supply, estuarine dissolved silica concentration is less than predicted by simple mixing and lower than in near-surface ocean water. Phytoplankton influence on dissolved silica concentration in the bay depends on water retention time in the estuary. River discharge modulates seasonal variations in estuarine water replacement time and dissolved silica supply. When river discharge is high, rapid dissolved silica utilization does not significantly influence its distribution. (Buchanan-Davidson--Wisconsin).
W76-07107

SURVIVAL OF SALMONELLAE, TOTAL COLIFORMS AND FECAL COLIFORMS IN SWINE WASTE LAGOON EFFLUENTS,
Clemson Univ., S.C. Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-07155

PATHOGENIC MICROORGANISMS IN THE ENVIRONMENT,
Agricultural Research Service, Beltsville, Md.; and Animal and Plant Health Inspection Service, Beltsville, Md.
G. B. Van Ness.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes - 1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 19-21.

Descriptors: *Pathogenic bacteria, *Livestock, *Water pollution, *Public health, *Farm wastes, Microorganisms, *Animal diseases, Waste treatment, Ureas.
Identifiers: Parasites.

Infectious diseases of livestock which are spread through manure and urine are the problems of herd management, unless the infectious agent also survives in the environment, and becomes a pollutant of other premises. Spread to other premises depends on biological properties inherent in the pathogenic organisms. In pollution control, there is need to give attention to some organisms, while others may be of little concern. Pathogens which can grow and multiply in the environment are very important pollutants. Some pathogens persist in the environment. Some virus pathogens are able to survive longer in the environment than do others, and can be dangerous pollutants. Some livestock parasites in animal wastes are also dangerous water pollutants. (See also W76-07154) (East Central)
W76-07156

DYNAMIC BEHAVIOR OF VINYL CHLORIDE IN AQUATIC ECOSYSTEMS,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
J. Hill, IV, H. P. Kollig, D. F. Paris, N. L. Wolfe, and R. G. Zepp.
Available from the National Technical Information Service, Sprinfield, Va 22161, as PB-249 302, $4.50 in paper copy, $2.25 in microfiche. Report EPA-600/3-76-001, January 1976. 63 p, 26 fig, 4 tab, 45 ref. 1BA023, ROAP 04AEM; Task 005, ROAP 03ACO, Task 009.

Descriptors: Systems analysis, Ecosystems, Chlorides, Model studies, *Biodegradation, Distribution, Aquatic environment, *Chemical degradation, *Simulation analysis.
Identifiers: *Vinyl chloride.

To evaluate the behavior of vinyl chloride in aquatic ecosystems, best estimate and worst case models of lake and stream ecosystems were analyzed through the use of mathematical simulation. The characteristics of the chemical, biological, and physical transformations of vinyl chloride indicated in the models were determined by laboratory experimentation and extrapolation of reaction data for similar compounds. These transformations included oxidation, substitution, elimination, hydrolysis, and free radical reactions; complexation; direct and indirect photochemical reactions; microbial degradation and toxicity; bacterial, algal, and fungal sorption; and volatilization. Loss of vinyl chloride from the aquatic environment by volatilization appeared to be the most significant process in its distribution. (EPA)
W76-07247

TOXAPHENE EFFECTS ON REPRODUCTION, GROWTH, AND MORTALITY OF BROOK TROUT,
Fish and Wildlife Service, Columbia, Mo. Fish Pesticide Research Lab.
F. L. Mayer, Jr., P. M. Mehrle, Jr., and W. P. Dwyer.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-249 383, $4.50 in paper copy, $2.25 in microfiche. Report EPA-600/3-75-013, November 1975. 42 p, 2 fig, 1 tab, 69 ref. 1BA021 (ROAP/Task 16AAK), EPA IAG-0153(D)

Descriptors: *Growth rates, *Brook trout, *Fish reproduction, Life cycles, *Mortality, Water pollution effects, Pesticides, Life cycles, Trout, *Pesticide residues, Insecticides.
Identifiers: *Toxaphene, Collagens, Chronic effects, Continuous exposure, Partial life cycle.

Yearling brook trout (Salvelinus fontinalis) were continuously exposed to toxaphene (0, 39, 68, 139, 288, and 502 ng/l) in a flow-through diluter system. Day length and water temperature were altered monthly to correspond to natural conditions. Adult growth was reduced in the 288 and 502 ng/l toxaphene exposures, and the added stress of spawning activities caused extensive mortalities in these concentrations. The numbers of eggs spawned and percent viability were inversely related to increasing toxaphene concentrations. All groups of fry exposed to toxaphene had reduced rates of growth and survival. Biochemical investigations on fry backbones demonstrated that bone collagen may be a sensitive indicator of normal and abnormal growth and development prior to being observed in the whole fish. Toxaphene was accumulated by brook trout 5,000 to 76,000 times that in the water and the more chlorinated isomers of toxaphene were preferentially stored. (EPA)
W76-07248

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON VINYL CHLORIDE AND POLYVINYL CHLORIDE.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W76-07249

COMPARATIVE PRIMARY PRODUCTIVITY OF TWO FLOOD CONTROL RESERVOIRS IN THE SALT VALLEY WATERSHED OF EASTERN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Zoology.
J. L. Andersen, and G. L. Hergenrader.
Trans Nebr Acad Sci. 2, p 134-143, 1973.

Descriptors: *Reservoirs, Productivity, *Primary productivity, *Secchi disks, *Chlorophyll, Light penetration, Turbidity, Cyanophyta, Eutrophication, Sedimentation, Flood control, *Nebraska, Cyanophyta, *Nutrients.
Identifiers: Salt Valley Watershed(Neb).

Primary productivity, Secchi disc visibility, chlorophyll, and nutrient concentrations were studied in Wagon Train and Stagecoach reservoirs during the yr 1969 and 1970. The reservoirs are separated by a distance of only 12 km and are similar in nutrient content and circulation pattern. Furthermore, in both reservoirs 92-100% of the productivity occurs in the upper 2m. However, the reservoirs differ markedly in their underwater light conditions and, consequently in their primary productivity. Wagon Train Reservoir is turbid due to suspended silt and clay particles while Stagecoach Reservoir lacks this turbidity. During the summer months, blue-green algal blooms occur frequently in Stagecoach Reservoir but only rarely in Wagon Train Reservoir. This appears to be due to the rapid attenuation of the light by the suspended silt and clay particles. In Wagon Train Reservoir, increased primary productivity is usually associated with increased Secchi disc visibility, while in Stagecoach Reservoir, increased primary productivity is often associated with decreased Secchi depths. Inorganic turbidity is an important factor affecting the productivity of Wagon Train Reservoir while algal production itself determines turbidity in Stagecoach Reservoir. Annual productivity in both study reservoirs, when compared to published values for carbon uptake from the other lakes and reservoirs, rates very high. Stagecoach Reservoir fixed 530 g C/m2/yr in 1969 and 834 g C/m2/yr in 1970. Wagon Train Reservoir increased from 148 g C/m2/yr, in 1969, a yr of high inorganic turbidity, to 453 g C/m2/yr in 1970, a yr of reduced inorganic turbidity.--Copyright 1974, Biological Abstracts, Inc.
W76-07254

MESOPHILIC CLOSTRIDIA IN PUGET SOUND,
Washington Univ., Seattle. Inst. for Food Science and Technology.
J. R. Matches, and J. Liston.
Can J Microbiol. 20(1), p 1-7, 1974.

Descriptors: *Clostridium, *Sediments, Sand, Gravel, Mud, *Washington, Mesotrophy, Bacteria, Microorganisms, Anaerobic bacteria.
Identifiers: Clostridium-bifermentans, Clostridium-novyi, Clostridium-perfringens, *Mesophilic clostridia, *Puget Sound(Wash).

Clostridia were isolated from marine sediments collected in Puget Sound in the State of Washington. Sampling stations varied in depth from 10-240 m and sediment types varied from sand and gravel to reduced mud. Counts of bacteria growing both aerobically and anaerobically at 30C were made. Aerobic and anaerobic counts were 1.21 to 16.9 x 10,000 and 0.73 to 23.5 x 10,000 cells/ml of sediment-water slurry respectively. About 30% of the bacteria growing anaerobically were obligate anaerobes and identified as clostridia. The identified clostridia fell into 12 groups. The 1st 3 groups, containing Clostridium perfringens, C. bifermentans and C. novyi, made up 76% of the isolates. A variety of species of mesophilic clostridia were found in marine sediments with C. perfringens isolated in the highest numbers.--Copyright 1974, Biological Abstracts, Inc.
W76-07255

WATER QUALITY AND BIOASSAY STUDY FROM CRAWFORD NATIONAL FISH HATCHERY,
Chadron State Coll., Nebr.
J. E. Taylor.
Trans Nebr Acad Sci. 2, p 176-181, 1973.

Descriptors: Fish hatcheries, Trout, *Rainbow trout, *Brown trout, *Bioassay, *Water quality, Toxicity, Pollutant identification, Acidity, Alkalinity, Ammonia, Hardness(Water), Oxygen, Nitrates, Nitrites, Temperature, Turbidity, Carbon, *Nebraska, Hydrogen.
Identifiers: Salmo-Trutta, Crawford National Fish Hatchery(Neb).

Water from Crawford National Fish Hatchery, Crawford, Nebraska, is of high quality for rearing rainbow (Salmo gairdnerii) and brown trout (S. trutta). Analyses were conducted for 2 mo. during the summer of 1971 with mean results as follows: Acidity 16 mg/l, alkalinity 202 mg/l, ammonia 0.6 mg/l, Ca hardness 201 mg/l, CO2 23 mg/l, dissolved O2 8 mg/l, nitrates 6 mg/l, nitrites 0.02 mg/l, pH 7.6, temperature 16C, and turbidity 4.6 J.T.U. Bioassay studies indicated lethal concentrations of ammonia and CO2 to brown trout to be 12 mg/l and 1.50 mg/l, respectively.--Copyright 1974, Biological Abstracts, Inc.
W76-07257

EUTROPHICATION OF SMALL RESERVOIRS IN EASTERN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
M. J. Hammer, and G. L. Hergenrader.
Trans Nebr Acad Sci. 2, p 70-80, 1973.

Descriptors: *Reservoirs, *Eutrophication, *Nebraska, Recreation, Turbidity, Light penetration, Algae, Cyanophyta.
Identifiers: Salt Valley.

Numerous small reservoirs constructed in Nebraska are used for recreation and many more are being planned. While these impoundments seemingly alleviate the long standing need for recreational waters, many existing impoundments exhibit symptoms of accelerated eutrophication after only a few years of existence. It is natural that such lakes, impounding nutrient-rich water, should be productive and generate nuisances that interfere with projected recreation uses. Neither this fact nor the lack of feasible methods for nutrient control were perceived prior to providing recreational facilities at the reservoir sites. Rates of eutrophication, nutrient sources and eutrophication control have been examined in a study of 5 eastern Nebraska reservoirs. Runoff waters impounded in the Salt Valley reservoirs have sufficient nutrient salts to support abundant growths of aquatic plants; reservoirs that are light-limited by soil turbidity support neither abundant growths of aquatic plants nor dense blue-green algal blooms; clear water reservoirs are very eutrophic--shorelines choked with rooted aquatics, dense blooms of blue-green algae, odorous emissions and occasional fish kills are typical characteristics of these impoundments; and in clear water reservoirs the rate of eutrophication is very rapid and appears to be directly related to age. Projections based upon existing data indicate that the useful life of these reservoirs for body-contact recreation is only a few years.--Copyright 1974, Biological Abstracts, Inc.
W76-07258

ICHTHYOPHTHIRIASIS IN THE MIRROR CARP CYPRINUS CARPIO (L.): IV. PHYSIOLOGICAL DYSFUNCTION,
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station.
R. S. Hines, and D. T. Spria.
J Fish Biol. 6(4), p 365-371, 1974.

Descriptors: *Fish parasites, *Carp, *Fish diseases.
Identifiers: Blood analysis, Ichthyophthiriasis, Ichthyophthirius-Multifiliis, Mirror Carp.

Changes in blood ion concentration, O2 absorption, blood Hb concentration and blood urea-ammonia N level were measured in a group of mirror carp infected with measured numbers of Ichthyophthirius multifiliis under standardized conditions. The disease was characterized by a drop in serum Na and Mg and increase in serum K. The ability of infected fish to absorb O2 was reduced as was their ability to tolerate dissolved O2 concentrations under 5 ppm. Blood urea-ammonia level was elevated during the disease but blood Hb level remained unchanged. (See also W76-07262; W74-13397 and W76-01410)--Copyright 1974, Biological Abstracts, Inc.
W76-07261

ICHTHYOPHTHIRIASIS IN THE MIRROR CARP CYPRINUS CARPIO (L): V. ACQUIRED IMMUNITY,
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station.
R. S. Hines, and D. T. Spira.
J Fish Biol. 6(4), p 373-378, 1974.

Descriptors: *Fish parasites, *Carp, *Fish diseases.
Identifiers: *Cyprinus-Carpio, *Ichthyophthiriasis, *Ichthyophthirius-Multifiliis, *Immunity, Mirror carp.

Mirror carp (C. carpio L.) infected with sublethal doses of Ichthyophthirius multifiliis, were free of parasites 21 days after infection. Fish remained free of parasites for at least 8 mo. when maintained in an infective environment. Such fish were refractory to reinfection with numbers of parasites that killed all normal, previously unexposed fish. Serum from fish recovered from previous infections with sublethal doses of parasites, immobilized free-swimming stages of I. multifiliis to a dilution of up to 1 :1024. The rise in serum-immobilization titer occurred between the 10th and 22nd days

of infection, the period during which parasites disappeared from the body surface of the fish. Infective stages of the parasite were unable to penetrate the mucus body covering of resistant fish. (See also W76-07261; W76-01410 and W74-13397)--Copyright 1974, Biological Abstracts, Inc.
W76-07262

RELATIVE IMPORTANCE OF SINGLE ALGAE SPECIES IN PLANKTONIC PRIMARY PRODUCTION, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
B. L. Gutel'makher.
Gidrobiol Zh. 10(1), p 5-10, 1974.

Descriptors: Algae, Primary productivity, Plankton, Photosynthesis, Equations, Pollutant identification.
Identifiers: Radiography.

Quantitative data on the role of single algae species in the plankton primary production and photosynthetic activity of different cell size phytoplankton species were obtained by autoradiography. Relatively small-celled algae form the deciduous part of the plankton primary production. Equation P/B (production/biomass) = 9V-0.54 expresses the relationship between P/B-coefficient and the cell volume.--Copyright 1975, Biological Abstracts, Inc.
W76-07263

CARP TRIETHYL CHLORIDE ABSORPTION FROM WATER; ITS DISTRIBUTION IN ORGANS AND TISSUES, (IN RUSSIAN),
Moscow State Univ., (USSR).
N. S. Stroganov, O. V. Parina, and K. F. Sorvachev.
Gidrobiol ZH. 9(6), p 59-66, 1973.

Descriptors: Carp, Absorption, Chlorides, Water pollution effects.
Identifiers: Triethyl chloride.

Triethyl chloride (TEC) was highly specific in its occurrence in the organs and tissues of carp Cyprinus Carpio. Essential accumulations were found in soft tissues, such as liver, brain, kidneys and red muscles. The value of TEC accumulation is a function of its concentration in water and time. The higher the concentration used, the higher the absolute and lower the relative TEC accumulation rates. Especially large quantities of TEC quickly accumulate in the bile. In the blood TEC accumulation is fairly restricted to the erythrocytes. The most affinity for TEC is shown by lipids and glycogen of the liver, brain and red muscles, the least, by white muscles.--Copyright 1974, Biological Abstracts, Inc.
W76-07264

THE FINAL STAGES OF SOME SMALL PONDS IN SW GERMANY, (IN GERMAN),
Tuebingen Univ. (West Germany). Lehrbereich fuer Spezielle Botanik.
D. Seidel, and S. Winkler.
Arch Hydrobiol. 73(1), p 84-107, 1974.

Descriptors: *Ponds, *Eutrophication, Europe, Bogs, Climates, Oligotrophy, Dystrophy, Aging(Biological), Succession.

The different successional stages of the hydrosphere in the 'Hulben' (small pools) of the Ostalb were traced. The 'Hulben' existing today represent all the stages recognizable from the ageing process of larger waters--from an oligotrophic condition through eutrophication to a final dystrophication. This last stage appears as a specific raised bog development which is favored by high precipitation and a cool climate.--Copyright 1974, Biological Abstracts, Inc.
W76-07269

PRODUCTIVITY OF HIGHER HYDROPHYTES AND STOCK OF PHYTOPHILIC INVERTEBRATES IN THE KILIA DELTA OF THE DANUBE, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2L.
W76-07277

MICROBIOLOGICAL PRODUCTION OF HYDROGEN SULPHIDE IN THE VEISOVO LAKE (SLAVYANSK LAKES), (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institute Biochemistry, Physiology and Microorganic.
E. N. Chebotarev, V. M. Gorlenko, and V. I. Kachalkin.
Mikrobiologiya. 43(2), p 231-325, 1974.

Descriptors: Microbiology, Photosynthesis, Production, Bacteria, *Eutrophication, Reservoirs, *Primary productivity, Sulfates, Lakes, *Hydrogen sulfide, Organic matter.
Identifiers: Ukrainian-SSR, Ooze, Bottom deposits, *USSR(Lake Veisovo), Sulfate reducing bacteria.

Lake Veisovo (Uhicunidan, SSR, USSR) is an eutrophic reservoir with primary production of organic matter by photosynthesis up to 800 micro C/1/day. The content of sulphates was high in water and bottom deposits. The rate of production of H2S was higher in ooze than in water: 2.0-19.0 and 0.02-0.08 mg H2S/day/kg of wet ooze or 1 l of water, respectively. Sulphate reducing bacteria were found everywhere in the water and in the bottom deposits; the maximum content was 150.10 sup 6 cells/l in the upper layer of ooze.--Copyright 1975, Biological Abstracts, Inc.
W76-07278

SEASONAL DYNAMICS OF BACTERIOPLANKTON OF THE KAPCHAGAL RESERVOIR IN THE THIRD YEAR OF ITS FILLING, (IN RUSSIAN),
N. K. Gulaya, and N. L. Tyuten'kova.
Izv Akad Nauk Kaz SSR Ser Biol. 12(2), p 40-45, 1974.

Descriptors: *Bacteria, Plankton, *Primary productivity, *Phytoplankton, *Decomposing organic matter, Reservoirs, Seasonal.
Identifiers: Kazakh-SSR, USSR(Kapchagal Reservoir).

Observations were made on the seasonal dynamics of bacterioplankton, primary production of phytoplankton and degradation of organic matter in the 3rd year of filling of the Kapchagai reservoir in Kazakh SSR (USSR). Certain patterns were established in the distribution of bacterioplankton and intensity of production and breakdown of organic matter in different areas of the reservoir and in different seasons. The activity of production and degradation of organic matter and the abundance of bacterioplankton decreased in the 3rd year.--Copyright 1975, Biological Abstracts, Inc.
W76-07279

THE EUTROPHICATION OF THE TITISEE AND ITS CONSEQUENCES FOR THE POPULATION DYNAMICS OF ZOOPLANKTON: I, (IN GERMAN),
E. Szymanski-Bucarey.
Arch Hydrobio Supplement b. 47(1), p119-166, 1974.

Descriptors: *Eutrophication, *Zooplankton, *Anabaena, Lakes, *Nitrates, *Phosphates, Reproduction.
Identifiers: Acanthodiaptomus-Denticornis, Anabaena-Flos-Aquae, Bosmina-Coregoni, Cyclops-Abyssorum, Diaphanosoma-Brachyurum, Germany, Mixodiaptomus-Laciniatus, *Titi Lake.

Eutrophication in Titi Lake has increased rapidly for the last few years: the periodic blooming of Anabaena flos-aquae, makes the process apparent. The main cause of the eutrophication of the lake is the increase of nitrates and phosphates. The content of nitrate is shown to have doubled and the phosphate content to be 10 times its original amount. Phosphate is the limiting factor. The Bosmina coregoni and Diaphanosoma brachyurum population decreases notably. Mixodiaptomus lacinatus lays its eggs earlier in the year and the development of the nauplius stages takes longer, overlapping that of the Acanthodiaptomus denticornis population. The population dynamics of Cyclops abyssorum in Titi Lake were studied for the 1st time.--Copyright 1975, Biological Abstracts, Inc.
W76-07281

MICROZOOPLANKTON OF LAKES OBELIJA, SLAVANTAS, GALSTAS AND DUSIA, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parizitologii.
S. I. Mazheikaite.
Liet Tsr Mosklu Akad Darb Ser C Biol Moksai. 4, p113-123, 1973.

Descriptors: *Zooplankton, *Lakes, Seasonal, Protozoa, *Water temperature.
Identifiers: Dusia, Galstas, Obelija, Slavantas, *USSR(Lithuania).

The microzooplankton of the lakes in south Lithuania (USSR) is rich in quality and quantity. Constituting more than 95% of the total density, Infusoria dominates among planktonic protozoa. The quantitative development of microzooplankton depends on ecological factors, particularly on the water temperature. In the upper layers of water the maximum development of microzooplankton took place in summer, the minimum in winter; in the deep layers it took place in each lake differently. In summer the abundance of planktonic protozoa in the upper layer of Lake Obelija reached 2.5-4.5, x 10 to the third power/l Lake Slavantas 3.0 x 10 to the third power/l Lake Galstas 0.4-0.7, x 10 to the third power/l and in Lake Dusia 1.5-1.6 x 10 to the third power/l.--Copyright 1975, Biological Abstracts, Inc.
W76-07283

DEVELOPMENT ASPECTS OF BACTERIAL FLORA UNDER DIFFERENT ECOLOGICAL CONDITIONS, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
K. K. Yankyavichyus, A. Yu. Baranauskene, and R. I. Razyulite.
Liet Tsr Mosklu Akad Darb Ser C Biol Mokslai. 4, p11-19, 1973

Descriptors: *Bacteria, Aquatic plants, Plankton, Cladophora, Ecosystems, Ecology.
Identifiers: *Chara-Aspera, *Cladophora-Glomerata.

Benthic plankton Chara aspera, Cladophoraglomerata is a serious rival for bacterial flora when using food substances in freshwater ecosystems. Bacterial numbers, generation period and mineralization intensity depend on the hydrochemical regime. Very often, P shortage is a limiting factor in the biochemical activity of bacteria. Benthic plankton may be used when choosing apparatus for the elimination of biogenous element concentrations, thus slowing the development of planktonic organisms.--Copyright 1975, Biological Abstracts, Inc.
W76-07284

CONTRIBUTION TO THE KNOWLEDGE OF THE ALGAL FLORA OF A FISHPOND IN

BRATISLAVE-ZELEZNA STUDNICKA, (IN CZECH),
Slovenske Polnohospodarske Akademie, Bratislava (Czechoslovakia). Laboratorium Rybarstva.
L. Zahumensky.
Zb Slov Nar Muz Prir Vedy. 19(2), p113-128, 1973.

Descriptors: Europe, Algae, Fish ponds, *Cyanophyta, *Chlorophyta, Seasonal, Aquatic plants.
Identifiers: Bacillariophyceae, Bratislave, *Czechoslovakia, Studnicka, Zelezna.

In a study of the qualitative and quantitative changes in the algae found in a fishpond (Czechoslovakia) in 1971, 135 spp. and 3 varieties were determined. Their dimensions are given. In the spring, mostly Bacillariophyceae were found and in the summer, Cyanophyta and Chlorophyceae predominated.--Copyright 1975, Biological Abstracts, Inc.
W76-07287

INFLUENCE OF FLOODING ON PH, OXIDATION-REDUCTION POTENTIAL AND SOIL PHOSPHORUS AVAILABILITY, (IN PORTUGUESE),
Instituto de Pesquisas e Experimentacao Agropecuarias do Sul, Pelotas (Brazil).
J. V. Moraes.
Pesqui Agropecu Bras Ser Agron. 8(7), p93-101, 1973.

Descriptors: *Flooding, Hydrogen ion concentration, Soils, Phosphorus, Oxidation-reduction potential, Waterlogging, Soil temperature, Fertilizers.

Four soils and 4 levels of P (0, 40, 80 and 120 kg/ha) were used with the objective of studying the influence of waterlogging on pH, redox potential (Eh) and P availability. The pH, the Eh the P of the soil solution and P extracted from soil by an anion exchange resin were determined every 7th day during the flooding period. The pH of the acid soils increased and the pH of the alkaline soil decreased after inundation. In both cases the final values were 6.5-7.0. The redox potentials of the soils changed remarkably after waterlogging. The Eh of the soils decreased rapidly for the 1st wk of submergence followed by a slow decrease during the 5th-7th wks, at which time Eh values became stable, between -200 and -300 mV. P applied to soil as a fertilizer was fixed at the beginning of the flooding. Availability increased only after pH and Eh changes had taken place. Both extracted and soil solution P increased with time of inundation. Correlation coefficients between these 2 forms of P were 0.91, 0.85, 0.90 and 0.88, respectively, for the soils La Granja loam, Mesillas clay, Hogamacho clay and Piedras Negras clay. Soil temperature influenced the velocity of changes on pH, Eh and P availability.--Copyright 1975, Biological Abstracts, Inc.
W76-07289

THE BENTHIC ALGAL VEGETATION OF THE BELGIAN PART OF THE RIVER MEUSE AND ITS RELATIONS WITH WATER POLLUTION, (IN FRENCH),
Liege Univ. (Belgium). Dept. of Botany.
J. -P. Descy.
Lejeunia. 66, p1-62, 1973.

Descriptors: *Algae, Benthos, *Vegetation, Water pollution effects, Rivers.
Identifiers: *Belgium(River Meuse).

The benthic algal vegetation of the Belgian part of the river Meuse and its relations with water pollution were studied.--Copyright 1975, Biological Abstracts, Inc.
W76-07291

SEVERAL ASPECTS OF BACTERIOLOGIC POLLUTION IN MOLLUSK-PRODUCING WATERS OF ALGARVE, (IN FRENCH),
Instituto de Biologia Maritima, Lisbon (Portugal).
R. Cachola, and M. C. Nunes.
Bol Inf Inst Biol Marit. 13, p1-9, 1974.

Descriptors: *Bacteria, *Coliforms, *Shellfish, Europe, Coasts, Clams, Mollusks, Oysters, Water pollution effects.
Identifiers: Cockles, *Portugal(Algarve).

Statistics on the coliform content in shellfish and in seawater in several southern coastal regions of Portugal (Algarve) from 1963-1972 are reported. Oysters, clams and cockles were studied. The pluviometric conditions of this region may have caused irregularities in the results. Typical coliform values were under 50 MPN (most probable number)/g of meat. In Faro and Tavira values were somewhat higher. At Fuzeta there is weak bacterial pollution.--Copyright 1975, Biological Abstracts, Inc.
W76-07293

ACTIVITY OF OIL OXIDIZING BACTERIA ISOLATED FROM THE WATER OF LAGOON OF KURSKI ZALIV AND THE BALTIC SEA COAST, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
B. A. Malamene.
Liet Tsr Mosklu Akad Darb Ser C Biol Mokslai, 4, p21-27, 1973.

Descriptors: *Bacteria, Coasts, Europe, *Oxidation, Carbon, Lagoons, *Oil pollution.
Identifiers: *Baltic Sea, *Oil oxidizing bacteria, Peptone, USSR.

On media with diesel oil, autol, mazut (the only carbon sources) oil oxidizing bacteria (25 cultures) isolated from the sea grew better than those isolated from the lagoon. Most of the oil oxidizing bacteria grew better on peptone medium than on that with oil. Mixture of oil oxidizing bacteria appeared to assimilate diesel oil and autol on nonsterile medium better than on the sterile one.--Copyright 1975, Biological Abstracts, Inc.
W76-07294

SEVERAL FACTS ABOUT THE CHANGES IN THE QUANTITY OF THE PHYTOPLANKTON OF THE DANUBE, (IN CZECH),
Slovenske Narodne Muzeum, Bratislava (Czechoslovakia).
S. Juris.
Zb Slov Nar Muz Prir Vedy. 19(2), p103-111, 1973.

Descriptors: *Phytoplankton, *Diatoms, Rivers, Algae, *Chlorophyta.
Identifiers: *Cryptomonas-Sp, *Czechoslovakia, *Danube River.

In May, June and July of 1967, water samples were taken between 1819 and 1819.5 km of the Danube, near the port of Gabcikova (Czechoslovakia). Despite the mixing effect of the 2 m/s current, the vertical distribution of phytoplankton is not even. Samples taken at a depth of 10 cm on the left bank, 1 km below the tributary Bakanske romeno, showed the highest concentration. Those from the right bank, taken 8 km below the nearest tributary, were only 36% of those from the other side. At the center of the stream, density was only 17% of that determined on the left bank. The density at a depth of 10 cm varied between 10,000 and 21,250 cells/ml on 1 day. The organisms were 14 diatoms, 17 green algae and 1 Cryptomonas sp.--Copyright 1975, Biological Abstracts, Inc.
W76-07300

A STUDY OF THE ZOOPLANKTON FROM THE DANUBE MOUTH AND FROM THE PREDELTA AREA DURING 1970 (IN GERMAN),
Academia R. S. R., Bucharest (Rumania). Institutul de Biologie.
V. Popescu-Marinescu.
Arch Hydrobiol Supplementb. 44(3), p 372-382, 1974.

Descriptors: *Zooplankton, Biomass, Deltas, Production, Rivers.
Identifiers: *Danube River, *Romania.

The quantitative and qualitative aspects of zooplankton from the mouth regions of the Danube branches (Sulina and Sf. Gheorghe) and from the predeltaic area northern Sulina Bay, southern Sulina Bay, and Sakhalin Bay (Romania) are discussed. The zooplankton of the Danube branches is characterized by predominance of the freshwater species and that of the predeltaic area by a mixture of limnic, brackish-water and marine species. In 1970, the seasonal variation of zooplankton in both regions was accentuated, on the main reasons being the exceptionally high flood. The zooplankton of both Danube branches and of the predeltaic area is rich in number of species but produces little biomass.--Copyright 1975, Biological Abstracts, Inc.
W76-07301

CONTENT OF HETEROTROPHIC MICROORGANISMS IN WATER OF LAKE BAIKAL, (IN RUSSIAN),
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsk (USSR).
E. A. Maksimova, V. N. Maksimov, and E. I. Vorob'eva.
Mikrobiologiya. 43(1), p124-128, 1974.

Descriptors: *Eutrophication, Lakes, Microorganisms, Bacteria, Water pollution effects.
Identifiers: Baikal, *Heterotrophic microorganisms, USSR, *Lake Baikal.

The number of heterotrophic microorganisms in a water layer from the surface to 100 m was studied at 24 pelagic stations of Lake Baikal. The southern and middle Baikal to Selenghin shoal contained heterotrophic microorganisms in an amount typical for oligotrophic lakes (1-5 cells/ml); the content of heterotrophs was 440 cells/ml in the surface water layer only near the town Baikalsk (USSR). Upper water layers contained 51 cells/ml in the regions near the river Turka and the Barghuzin bay. Eutrophied waters of the Small Sea influenced to a considerable degree the number of the heterotropic microorganisms at station 8, two km to the south of the Olkhon Gates (over 100 cells/ml in the surface layer). The number of heterotrophic microorganisms in the northern part of Lake Baikal did not exceed 20 cells/ml and was maximal for the lake in the course of the investigation. The heterotrophic bacteria are very important for self-purification of water of Lake Baikal.--Copyright 1975, Biological Abstracts, Inc.
W76-07302

DECOMPOSITION OF NITROGENOUS ORGANIC SUBSTANCES IN SURFACE WATERS, (IN RUSSIAN),
Hygieny a Epidemiologie, Prague (Czechoslovakia). Institut.
E. Vokounova.
Gig Sanit. 2, p 85-87, 1974.

Descriptors: *Decomposing organic matter, *Protein, *Nitrogen, *Chromatography, Surface waters, Pollutant identification.
Identifiers: Paper chromatography, Amines.

Laboratory experiments were carried out with reservoir water to which a model protein substance was added 1st and then various natural materials. At a dose of protein N equal to 12-14 mg/l 90% degradation occurred within 30 days, the

greater part within the 1st wk. At 1st ammonia formed and then it oxidized to nitrites and then to nitrates. During decomposition a number of free amino acids formed, mainly during the formation of ammonia. In addition to temperature, the breakdown of protein substances was affected also by the chemical composition of the water, mainly by the content of dissolved phosphates. Several primary and secondary amines were also differentiated and identified by paper chromatography.--Copyright 1975, Biological Abstracts, Inc.
W76-07303

CONTRIBUTION TO THE KNOWLEDGE OF THE DISTRIBUTION, BIOMASS AND DRIFT OF THE ZOOPLANKTON IN THE CZECHOSLOVAK-HUNGARIAN STRETCH OF THE DANUBE, (IN GERMAN),
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Lab. of Fisheries Hydrobiology.
M. Vranovsky.
Arch Hydrobiol Supplementb. 44(3), p 360-363, 1974.

Descriptors: *Biomass, *Zooplankton, Distribution patterns, *Littoral drift.
Identifiers: Czechoslovak, *Danube River, Hungary.

In a cross section of the Danube River (km 1820) an irregular horizontal distribution of zooplankton was found. The maximum values of the zooplankton biomass occurred in autumn and ranged between 300-600 mg/m3 fresh weight in 1966 and 1967. The average amount of the zooplankton drifing through the investigated section reached 136 g/s in 1966 and 260 g/s in 1967.--Copyright 1975, Biological Abstracts, Inc.
W76-07306

ZOOPLANKTON OF SMALL LAKES OF THE EASTERN PART OF THE BOLSHEZEMELSKAYA TUNDRA, (IN RUSSIAN),
N. V. Vekhov.
Biol Nauki. 17(2), p 7-13, 1974.

Descriptors: Zooplankton, Copepods, Crustaceans, Lakes, Rotifers, Tundras, Ponds, Biomass, Vegetation.
Identifiers: Bolshezemelskaya, Russian-SFSR, USSR.

Data are presented on the zooplankton of 5 small lakes and ponds located 25 km from Vorkuta in the Bolshezemelskaya tundra in the Archangel Oblast and Komi ASSR (Russ SFSR, USSR). The zooplankton of the ponds and lakes consisted of 42 spp. and subspecies of rotifers, 15 spp. and subspecies of cladocerans and 8 spp. of copepods. Some crustaceans and rotifers were found only in ponds. Most diverse was the zooplankton (35 spp.) in the overgrown zone of the lakes. In areas with open water the plankton was considerably scantier and represented mainly by crustaceans. The seasonal dynamics of the abundance and biomass of the plankton was different in different lakes. Two groups of lakes were distinguished. In one the zone of shore vegetation was well defined and the plankton was diverse, mainly owing to forms of caldocerans and rotifers living in the overgrowth; in the other overgrowths of higher aquatic plants were absent, plankton was weakly developed, its species composition was scanty and peaks of the abundance and biomass of the plankton were not apparent.--Copyright 1975, Biological Abstracts, Inc.
W76-07307

THE EFFECT OF MEASURES REDUCING EUTROPHICATION ON THE PHYTOPLANKTON OF THE REITHER SEA IN TYROL (AUSTRIA), (IN GERMAN),
I. Findenegg.
Ber Naturwiss-Med Ver Innsb. 60, p 7-14, 1973.

Descriptors: *Eutrophication, Phytoplankton, Europe, Water pollution control, Nutrients, Seasonal, Measurement, Biomass, Algae, Lakes.
Identifiers: Austria, *Reither Sea, Tyrol.

Measures were taken to control eutrophication of the Reither Sea (area 1.5 ha, 8 m deep) by accelerating nutrient outgo. Since 1972 water of the hypolimnion rich in nutrients is drawn off by a siphon. In May, the lake was sprinkled with ferric chloride. Routine identification and counting of the phytoplankton was carried out in 1971 and 1972 in order to evaluate the efficacy of the nutrient dilution and the chemical treatment. In spring and autumn of 1972 the algal biomass proved to be somewhat lower than in the same seasons of 1971. In summer it was almost twice as high. No direct result of the chemical flocculation of the phytoplankton was observed. It is assumed that the nutrient dilution was effective in lowering the algal biomass but that this effect was overcompensated by pollutants brought into the lake during the summer in connection with the tourist industry.--Copyright 1975, Biological Abstracts, Inc.
W76-07308

RESTORATION OF A EUTROPHICATED LAKE (REITHER SEA, TYROL, AUSTRIA), (IN GERMAN),
Innsbruck Univ. (Austria). Inst. of Zoology.
R. Pechlaner, and N. Schultz.
Ber Naturwiss-Med Ver Innsb. 60, p 183-201, 1973.

Descriptors: *Lakes, Eutrophication, Europe, Nutrients, Recreation, Secchi disk, Oxygen, Phosphorus, Temperature.
Identifiers: *Austria, *Reither Sea, Tyrol, *Lake restoration.

Nutrient inflow to the Reither Sea from point sources was stopped in 1961, but the recreational value of this small, highly eutrophic lake continued to decrease. The following methods of lake restoration were applied in 1972: Hypolimnetic water was drawn from the lake by means of an 'Olszewski-tube.' Surface water was treated with ferric chloride to precipitate dissolved and suspended material, thus cleaning the epilimnion and intensifying the elimination of plant nutrients via the Olszewski-tube. Water renewal was accelerated by piping surplus drinking water to the lake. The effects of these measures on temperature, O2 and P concentrations and Secchi disk transparency are described. The response of phytoplankton is discussed by Findenegg.--Copyright 1975, Biological Abstracts, Inc.
W76-07309

HYDROBIOLOGICAL OBSERVATIONS ON THE RIVER RIUL DOAMNEI (DISTRICT ARGES), (IN ROMANIAN),
Institutul de Cercetari si Proiectari Aliment., Bucharest (Rumania).
M. Gheorghe.
Bull Cercet Piscic. 31(3/4), p 25-34, 1972.

Descriptors: Rivers, Europe, Ecology, Salmonids, Diatoms, Fish, Trout, Chub, Mackerel, Bullhead, Larvae, Productivity.
Identifiers: Barbus-Meridionalis-Petenyi, Chironomidae, Chondrostoma-Nasus, Cottus-Gobio, Doamnei, Ephemeroptera, Leuciscus-Cephalus, Man, Nemachilus-Barbatulus, Phoxinus-Phoxinus, Plecoptera, Riul, *Romania, Romanichthys-Valsanicola, Salmo-Trutta-M-Fario, Trichoptera.

The Riul Doamnei River (in Romania) not thoroughly studied ecologically till now, presented a 'troubled' balance as a consequence of the recent and heavy intervention of man. The river's water has been directed towards Lake Vidraru. The river's faunistic and floristic association, includes numerous elements present in the food of salmonids: Diatomea and Ephemeroptera, Plecoptera, Trichoptera, Chironomidae larvae. The vertebrates were represented mainly by fishes. The Riul Doamnei River's fauna includes 18 fish species belonging to 6 families, the Cyprinids forming 55%. The most numerous fish species are: the river trout (Salmo trutta m. fario) the chub (Leuciscus cephalus), the minnow (Phoxinus phoxinus), the mackerel (Chondrostoma nasus), the spotted barbel (Barbus meridionalis petenyi), the stone loach (Neomachilus (Orthrias) barbatulus) and the bullhead (Cottus gobio); Romanichthys valsanicola mentioned previously, was not found again. In relation to the hydrographic characters, and the quality and quantity of water flora and fauna, the water courses of the Riul Doamnei basin present a moderate biogenic capacity. The trout zone, poorly populated with fishes, has a low natural productivity. In the period 1969-1972 the Riul Doamnei River, was a depopulated ecosystem, unmanaged for fish culture.--Copyright 1975, Biological Abstracts, Inc.
W76-07310

PHYTOPLANKTON OF SOME PONDS AND LAKES OF DAGESTAN ASSR, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva Makhachkala (USSR).
L. P. Lazareva, and A. K. Magomedov.
Gidrobiol Zh. 10(1), p 67-70, 1974.

Descriptors: *Phytoplankton, Ponds, Lakes, Fisheries, Fish stocking, *Cyanophyta, *Diatoms, Anabaena, Scenedesmus.
Identifiers: Amphora, Coelastrum, Crucigenia, Dactylococcopsis, *Dagestan-ASSR, Eunotia, Gloeocapsa, Gyrosigma, Kirchneriella, Merismopedia, Microcystis, Navicula, Nitzschia, Oocystis, Oscillatoria, Rediastrum, Rhicosphenia, Scenedesmus, Stephanodiscus, Surirella, Tetraedron, Treubaria, USSR, *Protococcaceae.

Data are presented on the phytoplankton of fishery ponds, lakes Ak-Gel and Temirgoe and ponds near Lake Mekteb, located in the lowland region of Dagestan ASSR (USSR), which differed in morphometric data, location, physicochemical state, composition of fish fauna and density of fish stocking. Ranking 1st in abundance in the lakes and ponds were blue-green algae (Gloeocapsa, Merismopedia, Anabaena, Oscillatoria, Dactylococcopsis, Microcystis, etc.), then diatoms (Navicula, Nitzschia, Stephanodiscus, Diatoma, Surirella, Amphora, Eunotia, Gyrosigma, Rhoicosphenia, etc.), and 3rd place was occupied by Protococcaceae (Scenedesmus, Pediastrum, Coelastrum, Crucigenia, Kirchneriella, Oocystis, Tetraedron, Treubaria).--Copyright 1975, Biological Abstracts, Inc.
W76-07311

THE EFFECT OF SOME METALS ON PRIMARY PRODUCTION IN THE COASTAL WATER OF THE CASPIAN SEA, (IN RUSSIAN),
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
S. A. Patin, V. N. Tkachenko, A. M. Ibragim, and L. V. Fedotova.
Okeanologiya. 14(1), p 91-94, 1974.

Descriptors: Primary productivity, Metals, Water pollution effects, Coasts, Cadmium, Cobalt, Copper, Mercury, Lakes, Toxicity, Zinc.
Identifiers: Aphanizomenon-flos-aquae, Carbon-14, *Caspian Sea, Exuviaella-cordata, Thalassiosira-gaspica, USSR.

The studies with the radiocarbon method revealed the influence of additions of Hg, Cd, Cu, Co and Zn salts on the rate of photosynthetic assimilation in coastal sea water samples (Aphanizomenon flosaquae, Exuviaella cordata, Thalassiosira caspica dominants) of the West Caspian Sea (USSR). The experiments were performed at a temperature and illumination close to the photosynthetic conditions in the surface layer of the sea. Inhibition is shown at comparatively low

concentrations (1-10 microgram/L) of Hg, Cu and Cd; Hg had the greatest toxicity. The introduction to the samples of 1 to 100 microgram/L Co and K2PO4 had no effect.--Copyright 1975, Biological Abstracts, Inc.
W76-07313

DISTRIBUTION, PHYTOCENOLOGY AND PRODUCTIVITY OF NYMPHAEACEAE IN RESERVOIRS OF THE DNIEPER CASCADE, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev (USSR). Central Republican Botanical Garden.
D. V. Dubyna.
Ukr Bot Zh. 30(6), p 694-701, 1973.

Descriptors: *Distribution, *Productivity, Reservoirs, Water level fluctuation.
Identifiers: Drugs, Fodder, Nuphar-luteum, Nymphaea-alba, Nymphaea-candida, *Nymphaeaceae, *Phytocenology, *USSR(Dnieper Cascade).

In 1968-1972 distribution and reserves of Nymphaeceae (Nymphaea alba, N. candida, Nuphar luteum) were studied in the Kiev, Kremenchuk and Kakhovka reservoirs being in the Polesye, Forest-Steppe and Steppe zones, respectively (USSR). For comparison their reserves in the natural basins are studied. Nymphaeaceae cover 5-7% of shallow areas in the Kiev, 1-2% in Kremenchuk and 0.5% Kakhovka reservoirs. The maximum yield of green mass and rhizomes is observed in the natural basins and reservoirs in Polesye, the minimum one in the Steppe zone. Sharp fluctuations of water level affect negatively the growth and development of Nymphaeaceae; the hydrological conditions are most stable in the Kiev reservoir. A problem is put concerning the protection of Nymphaeaceae and enrichment of their reserves as they are of a considerable value as drug, food, fodder and ornamental plants.--Copyright 1975, Biological Abstracts, Inc.
W76-07314

DENSITY AND BIOMASS OF PHYTOPLANKTON POPULATIONS IN AN APENNINE LAKE (LAKE SANTO PARMENSE) DURING THE WINTER FREEZE, (IN ITALIAN),
Parma Univ. (Italy). Laboratorio di Ecologia.
I. Ferrari, and L. Camurri.
Ist Lombardo Accad Sci Lett Rend Sci Biol Med B. 107(1), p 33-42, 1973.

Descriptors: *Biomass, *Phytoplankton, Freezes, Lakes, Photosynthesis, Algae, Chlorophyll, Europe, Density, Nutrients, Zooplankton.
Identifiers: Apennine, Italy, Santo-parmense.

Water samples for analysis of phytoplankton and photosynthetic pigments were collected in Largo Santo Parmense (1507 m; North Apennine, Italy) during the winter cover from Jan. to Apr., 1973. The samples were always collected at 7 different depths from a station corresponding to the maximum depth of the lake (22.5 m). The algae in the samples were counted. Fresh weight of phytoplankton and concentration of chlorophyll a were determined. There is a good correlation between these 2 parameters. There is an evident trend towards a decrease in both density and biomass of the phytoplankton from Jan. to Apr. In the earlier series of samples, the highest values of biomass are observed at -5 m and -10 m depths. The succession of phytoplankton density and biomass during winter cover is correlated with the dynamics of other parameters, such as the thickness of ice cover, the concentration of algal nutrients and of O2, the density of grazing zooplankters.--Copyright 1975, Biological Abstracts, Inc.
W76-07316

THE EFFECTS OF THREE ANTI-PETROLEUM AGENTS ON THE PRIMARY PRODUCTIVITY OF AN EXPERIMENTAL COMMUNITY OF BENTHIC DIATOMS, (IN FRENCH),
Museum National d'Histoire Naturelle, Paris (France). Laboratoire de Physiologie Generale et Comparee; and Institut Oceanographie.
J.-C. Lacaze.
Vie Milieu Ser B Oceanogr. 23(1), p 51-67, 1972.

Descriptors: *Primary productivity, *Diatoms, Benthos, Systematics, Oil pollution, *Emulsifiers.
Identifiers: Carbon-14, Corexit, Gamosol, Sefoil, Substrates.

The effects of 3 anti-oil emulsifying agents on the taxonomic composition and the primary productivity of an experimental community of benthic diatoms were studied. This association of microalgae develops on artificial polished glass supports immersed in a 3000-l brackish ecosystem in the laboratory. The community's photosynthetic activity was measured by carbon 14 and pH-carbonic gas. The exposure periods varied (1, 15, 30 min and 3 and 10 h) for the concentration of 40 mg 1/l of each of the 3 anti-oil substances. The effects of the pollution were studied immediately after exposure to the substances (short-term effects), then after 5, 10 and 30 days (long-term effects). Two of the anti-oil substances (Sefoil and Corexit) do not change primary production and therefore, in this aspect, show no toxicity under test conditions. Gamosol, a substance used massively when the oil tanker 'Torrey Canyon' was shipwrecked (18th March, 1967), is distinctly toxic. Only long-term tests make it possible to show the real effect of a polluting substance. Thus, a 30-min Gamosol exposure, which at first induces only a slight decrease of primary production, after 5 days is fatal. Microscopic observation shows that the algae forming the community are destroyed through this exposure. A new community, made up of small diatom species, then develops rapidly, so that after 30 days, primary production of the communities having undergone pollution is twice that of the control communities.--Copyright 1975, Biological Abstracts, Inc.
W76-07317

STUDIES ON THE BIOLOGY OF DREISSENA POLYMORPHA PALLAS IN LAKE CONSTANCE, (IN GERMAN),
Freiburg Univ. (West Germany). Limbologisches Institut.
N. Walz.
Arch Hydrobiol Supplementb. 42(3/4), p 452-482, 1973.

Descriptors: *Lakes, Europe, *Mussels, Water supply, Distribution, Water pollution effects, Water pollution control.
Identifiers: Dreissena-Polymorpha, *Germany(Lake Constance).

The immigration of Dreissena, a freshwater mussel, into Lake Constance and the subsequent increase in numbers was a potential danger to the water supply. Accordingly the distribution of the free-swimming veliger larvae was investigated in 2 parts of the lake. Numbers settling varied greatly according to the nature of the substratum presented. The largest specimens occurred in the shallow water; there was a steady fall in average size down to 30 m and in deeper water size remained steady. A method of controlling the mussels in pipes by means of atmospheric N was developed.--Copyright 1975, Biological Abstracts, Inc.
W76-07400

WHAT SHOULD BE DONE WITH HAUGATJERN, (IN NORWEGIAN),
Tromsoe Museum (Norway). Dept. of Zoology.
O. J. Jacobsen, and V. Ausen.
Fauna (Oslo). 27(3), p 160-165, 1974.

Descriptors: *Eutrophication, Lakes, Europe, *Trout, Fish reproduction, *Oxygen requirements, Fish food organisms.
Identifiers: Eutrophication, *Norway(Haugatjern), *Whitefish.

Haugatjern a small euthrophic lake situated east of Roros in the county of Sor-Trondelag (Norway), is widely known for its high whitefish production, about 400 kg/ha/yr in its best period. Late recruitment to the whitefish stock has been insufficient due to an O2 deficit in the lake in winter. Practical methods to increase the stock might include transferring water from a nearby river and attempts to stop further eutrophication. To obtain maximum benefit of the fish food organisms in the lake it would probably be profitable to release trout in addition to the whitefish.--Copyright 1975, Biological Abstracts, Inc.
W76-07401

DECOMPOSITION OF PARTICULATE ORGANIC MATERIALS IN TOKYO BAY AT SUMMER STAGNATION PERIOD IN 1972,
Tokyo Univ. (Japan). Ocean Research Inst.
H. Seki, H. Shinoyama, M. Muto, and H. Numanoi.
Mer (Tokyo). 12(1), p 9-15, 1974.

Descriptors: Decomposing organic matter, Bays, Asia, Microorganisms, Summer.
Identifiers: *Japan(Tokyo Bay).

Studied on some organic composition of particles with microorganisms in the water column of Tokyo Bay (Japan) show that sedimentation of the particles is much faster than the complete decomposition of easily decomposable organic particles before their arrival at the bottom of the sea during the summer stagnation period.--Copyright 1975, Biological Abstracts, Inc.
W76-07406

FORMATION ASPECTS OF ZOOPLANKTON SPECIES COMPOSITION IN TWO DIFFERENT-TYPE RESERVOIRS IN EASTERN GEORGIAN SSR, (IN RUSSIAN),
Tbilisskii Gosudarstvennyi Universitet (USSR).
Z. M. Kereselidze.
Soobshch Akad Nauk Gruz SSR. 74(3), p 725-727, 1974.

Descriptors: *Zooplankton, Reservoirs, *Eutrophication, Oligotrophy, Ecology.
Identifiers: *USSR(Georgian-SSR).

The formation peculiarities of the zooplankton species composition in 2 reservoirs (located in eastern Georgia (USSR)) of different types (oligotrophic and eutrophic) were examined in connection with ecological factors.--Copyright 1975, Biological Abstracts, Inc.
W76-07413

MICROFLORA OF DIFFERENT TYPES OF MINERAL WATERS OF SOUTHEASTERN REGION OF WEST SIBERIA, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Kurortologii i Fizioterapii, Tomsk (USSR).
T. M. Tronova.
Mikrobiologiya. 43(1), p 129-132, 1974.

Descriptors: Aquatic plants, *Bacteria, Microbiology, Microorganisms, Water pollution effects, Asia.
Identifiers: *Mineral waters, *Mycobacteria, *USSR(West Siberia).

Microbiological studies of mineral waters of different types from the southeast of west Siberia (USSR) carried out in 1968-1972 have shown that these mineral waters contain various microflora participating in the turnover of N, C, S and Fe. The total number of microorganisms varies from hundreds of thousands to several millions of cells

per ml of water. Mycobacteria, denitrifying, sulfate reducing, hydrocarbon oxidizing and methane forming bacteria predominate in these waters. Each water type has a typical composition of physiological groups of bacteria.--Copyright 1975, Biological Abstracts, Inc.
W76-07416

THE TRICHOPTERA OF THE SUNDAYS AND FISH RIVERS, EASTERN CAPE PROVINCE, SOUTH AFRICA,
Albany Museum, Grahamstown (South Africa).
K. M. F. Scott.
Ann Cape Prov Mus Nat Hist. 9(13), p 223-235, 1974.

Descriptors: Africa, Rivers, Aquatic animals, *Water quality, Water level fluctuations, Fish, Farm management.
Identifiers: Anabolia-Sp, Cape, *Cheumatophsyche-Afra, Ecnomus-Forbesi, Ecnomus-Thomasseti, Hydroptila-Capensis, Hydroptila-Cruciata, Limnephilus-Sp, Simulium-Sp, *Trichoptera, *South Africa(South River Sunday River).

The impoverishment of the Trichoptera fauna is intensified by the poor quality of the water, arid climate, geology of the area, farming methods and alternations between drought and flood. The abrasive action of sand and silt and fluctuations in water levels were important factors in the reduction of stream populations. Different species of Cheumatopsyche occur in Sundays and Fish Rivers in spite of the many similarities between them. The species found were: Cheumatopsyche afra (Mosely), Ecnomus thomasseti Mosely, E. forbesi Scott, Hydroptila sp., H. capensis Barnard and H. cruciata Ulmer, Simulium sp., Limnephilus sp., Anabolia sp.--Copyright 1975, Biological Abstracts, Inc.
W76-07417

SURVIVAL OF LISTERIA MONOCYTOGENES IN SOIL AND WATER,
Michigan Univ., Ann Arbor. Dept. of Wildlife and Fisheries.
R. G. Botzler, A. B. Cowan, and T. F. Wetzler.
J Wildl Dis. 10(3), p 204-212, 1974.

Descriptors: *Michigan, Ponds, Bacteria, *Soil bacteria, Reservoirs, Path of pollutants, Water pollution effects.
Identifiers: *Listeria-Monocytogenes, George Reserve(Mich).

L. monocytogenes (pathogenic for wild animals) survived over 8 wk in pond water, with no evidence of multiplication. Listeria multiplied in sterilized soil during the late winter and early spring. The growth rate in soil was correlated ($p < 0.005$) to the ambient air temperature. The evidence suggests that soil is the reservoir of Listeria on the George Reserve.--Copyright 1974, Biological Abstracts, Inc.
W76-07423

STOMACH CANCER AND ECOLOGIC FACTORS IN JAPAN,
Tohoku Univ., Sendai (Japan). Dept. of Hygiene.
E. Takahashi.
Tohoku J Exp Med. 113(2), p 129-133, 1974.

Descriptors: *Human diseases, Diseases, *Ecology, Mineralogy, Rivers, *Mortality, *Water quality, Calcium, Sulfates, Chlorides, Vitamins, Water pollution effects.
Identifiers: *Cancer, Carcinogenesis, *Ecologic factors, *Japan, *Minerals, Stomach cancer, *Sunshine.

The correlation between mortality rate from stomach cancer and some basic ecological factors such as average temperature, sunshine duration and mineral content of river water was studied on 46 prefectures in Japan. Peculiar geographic distribution of the death rate from stomach cancer in Japan is as introduced by Segi and others. The river water quality is expressed as the ratio of Ca/SO4. The negative correlation coefficients of the male age-adjusted stomach cancer mortality rate with yearly sunshine duration and the Ca/SO4 ratio of river water were significant, but no correlation was found with yearly average temperature. The meaning of the significant correlation is interpreted as follows. Sulfate and chloride seemed to be etiological agents of inflammation which sometimes develop into ulcers, polyps and cancer in the stomach mucous membrane. Ca has an antiphlogistic effect, because of its capillary permeability reducing action, which may also prevent lodging of tumor cells in hematogenous metastases of cancer in the microcirculation system. Sunshine duration may be concerned with Ca absorption through its action of vitamin D production in skin.--Copyright 1974, Biological Abstracts, Inc.
W76-07424

HYGIENIC CHEMICAL STUDIES ON WATER QUALITY OF THE MOAT OF IMPERIAL PALACE: I. RELATIONSHIP BETWEEN SEASONAL WATER QUALITY AND MICROFLORA IN THE MOAT. (IN JAPANESE),
National Inst. of Hygienic Sciences, Tokyo (Japan).
Y. Sayato, S. Matsui, K. Nakamuro, M. Ando, and M. Tonomura.
J Hyg Chem. 19(2), p 94-101, 1973.

Descriptors: *Water quality, *Seasonal, *Eutrophication, Plankton, Oxygen, Alkalinity, *Chemical analysis.
Identifiers: Imperial palace, *Japan, *Moats.

Seasonal changes in the quality of water and in plankton was investigated in the moat around the Imperial Palace (Japan). At present the moat is not polluted by industrial or domestic waste water. The sampling stations were placed at 8 points in the moat and the following results were obtained: changes in the quality of water and in plankton showed a seasonal characteristic pattern; the water of the moat is eutrophic because of the alkalinity and excessive saturation of dissolved O2 in the water and formation of the so-called aquatic bloom, the growth and decay of plankton in the moat are related to biochemical O2 demand, dissolved O2, dissolved silicate, and sulfide. (See also W76-07427) Copyright 1975, Biological Abstracts, Inc.
W76-07426

HYGIENIC CHEMICAL STUDIES ON WATER QUALITY OF THE MOAT OF IMPERIAL PALACE: II. RELATIONSHIP BETWEEN WATER QUALITY AND HORIZONTAL INSOLATION INTENSITY, (IN JAPANESE),
National Inst. of Hygienic Sciences, Tokyo (Japan).
Y. Sayato, S. Matsui, K. Nakamuro, M. Ando, and M. Tonomura.
J Hyg Chem. 19(2), p 102-105, 1973.

Descriptors: *Asia, Eutrophication, *Water quality, Water pollution, Oxygen, *Chemical analysis.
Identifiers: Horizontal insolation intensity, Imperial palace, Insolation intensity, *Japan, *Moats, Hibiya Bori.

The yearly and daily changes in the quality of water in the moat around the Imperial Palace (Japan) were examined to find a relationship, if any, between water quality and horizontal insolation intensity (HII). The sampling station for the daily survey was placed at the moat of Hibiya Bori, and the following results were obtained: quality of the water in the moat is eutrophic, and yearly progressive pollution was not recognized; the HII is related to dissolved O2 in the Hibiya Bori in summer. (See also W76-07426)--Copyright 1975, Biological Abstracts, Inc.
W76-07427

A TEST OF THE HYPOTHESIS THAT ABIOTIC PHOSPHATE COMPLEXING INFLUENCES PHOSPHORUS KINETICS IN EPILIMNETIC LAKE WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
D. R. S. Lean, and F. H. Rigler.
Limnol Oceanogr. 19(5), p 784-788, 1974.

Descriptors: *Lakes, *Eutrophication, *Analytical techniques, Model studies, *Kinetics, *Phosphorus, Epilimnion, Filters, Membranes.
Identifiers: Epilimnetic, Phosphorus-32.

The uptake kinetics of 32P-PO4 added to water from a eutrophic lake are frequently biphasic; consequently the system cannot be described by a 2-compartment exchange model. Experiments in which uptake kinetics and the effectiveness with which hydrous zirconium oxide removes 32P-PO4 from filtered lake water were measured concurrently showed that the biphasic kinetics cannot be explained by postulating an abiotic complexing of 32P-PO4 with some other component of membrane filtered lake water.--Copyright 1975, Biological Abstracts, Inc.
W76-07429

TURNOVER AND UPTAKE OF DISSOLVED PHOSPHATE IN FRESHWATER: A STUDY IN LAKE KINNERET,
Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
M. Halmann, and M. Stiller.
Limnol Oceanogr. 19(5), p 774-783, 1974.

Descriptors: *Lakes, *Pollutants, *Phosphates, *Analysis, *Freshwater, Nutrients, Surface waters, Eutrophication.
Identifiers: *Israel(Kinneret Lake).

The residence times and turnover rates of dissolved phosphate in the surface water of Lake Kinneret and in the Jordan River (Israel) above and below the lake were measured by adding 32P-HPO42- tracer to the unfiltered water and determining its disappearance from solution. Residence times varied from 9.1-0.2 h in winter and summer at water temperatures of 14.5-30 C: the turnover rates (V) ranged from 0.02-0.20 micro M h-1. The rate of uptake by plankton (V4) of dissolved phosphate could be fitted to a Monod equation, $Vi = VmS/(Ks + S)$, in which Vm and Ks are the maximal rate and the half-saturation constant. Values of Vm were in the range of 0.04-1.1 micro M h-1 for winter and summer; Ks values ranged from 0.2-0.8 micro M, higher than the usual observed natural concentration of dissolved phosphate in Lake Kinneret. In Lake Kinneret, phosphate is apparently the primary limiting nutrient. In the Jordan River, upstream of Lake Kinneret, the dissolved phosphate concentration (0.44 micro M) was higher than the Ks value (0.27 micro M) and therefore here phosphate may not be the primary limiting nutrient.--Copyright 1975, Biological Abstracts, Inc.
W76-07430

EXPERIMENTAL CHARACTERIZATION OF LACUSTRINE CHLOROPHYLL DIAGENESIS: II. BACTERIAL, VIRAL AND HERBIVORE GRAZING EFFECTS,
North Carolina State Univ., Raleigh. Dept. of Zoology.
R. J. Daley.
Arch Hydrobiol. 72(4), p409-439, 1973.

Descriptors: *Bacteria, *Crustaceans, *Algae, *Chlorophyll, *Effects, *Analytical techniques, *Chromatography, Lakes, Limnology, Herbiuores, Pollutant identification.

Identifiers: Cytophaga-Phycophthora, Daphnia-Pulex, OchromonasoSp.

The effects of a bacterium, a cyanophage, a crustacean and a phagotrophic flagellate on chlorophyll destruction and chlorophyll derivative formation in several algae were studied using thin-layer chromatography and scanning chromatogram fluorometry. Chlorophyll could not be catabolized directly by the bacterium, Cytophaga phycophthora, but was rapidly destroyed by photooxidation following cell lysis induced by both the bacterium and the LPP-I virus. Pheophytins and allomerized phorbins were formed concurrent with destruction in the presence of oxygen and acids, repectively. Ingestion of algae by both herbivores, Daphnia pulex and Ochromonas sp., resulted in the destruction of chlorophyll and the formation of pheophytins and pheophorbides. The a and b phorbins, organic C and organic N were all destroyed at the same relative rates by D.pulex. Post-lytic photochemical oxidation and herbivore predation are the principal mechanisms of chlorophyll diagenesis in situ. The paleolimnological implications of the results are discussed and the use of the sedimentary pheophorbides as a measure of herbivore grazing pressure through postglacial time is suggested.--Copyright 1975, Biological Abstracts, Inc.
W76-07431

5D. Waste Treatment Processes

OVERLAND FLOW TREATMENT OF SWINE MANURE LAGOON EFFLUENT,
Oregon State Univ., Corvallis. Water Resources Research Inst.
J. O. Boda, and T. L. Willrich.
Completion Report WRRI-40, February 1976. 149 p, 17 fig, 45 tab, 36 ref. OWRT A-017-ORE(1).

Descriptors: *Overland flow, *Waste water treatment, *Hogs, Pollution abatement, *Farm wastes, *Farm lagoons, Anaerobic conditions, Waste treatment, Water quality control.
Identifiers: Swine manure, *Anaerobic lagoons.

Effluent from an anaerobic swine manure lagoon was applied at the upper end of six, 100 feet (30.5 m) long by 3 feet (0.9 m) wide, grass covered plots which sloped about 3 percent. Objectives of this study were to measure concentration attenuation and mass reduction of potential pollutants in the wastewater as the result of overland flow, and to examine the influences of experimental variables on the effectiveness of the overland flow wastewater treatment process. Controlled variables included application rate and grass species. Seasonal differences in temperature, precipitation, and related physical, chemical and biological conditions were uncontrolled variables. Wastewater and soil horizons were sampled and analyzed at selected plot intervals, and plot runoff volume, air temperature, precipitation, and water table data were recorded. Amounts of wastewater applied to the experimental plots ranged from 2.0 to 10.8 inches (5.1 to 27.4 cm) per week. Grass cover on three plots was Alta fescue. The other three plots were seeded with redtop.
W76-06808

POULTRY PROCESSING PLANT WASTEWATER DISPOSAL ON SOD,
Maryland Univ., College Park. Dept. of Agronomy.
G. L. Miller, and J. H. Axley.
Maryland Water Resources Research Center, College Park, Technical Report 36, (1975). 80 p, 14 fig, 31 tab, 69 ref. OWRT A-013-MD (1) 14-31-0001-5020.

Descriptors: Poultry, *Waste water disposal, *Waste assimilative capacity, Nutrient removal, Infiltration, Filtration, *Water reuse, Grasses, Bluegrasses, Forage grasses, *Fescues, Soils, Loam, Drainage.
Identifiers: *Sod assimilation waste water, *Poultry processing wastes.

The rectification of poultry processing wastewater was investigated by utilizing soil and forage as a renovating and filtering system. Kentucky bluegrass (Poa pratensis L.), Penncross bentgrass (Agrostis palustris Huds var. Penncross), ladino clover (Trifolium repens L.), red top (Agrostis alba L.), tall fescue (Festuca arundinacea Schreb.), smooth bromegrass (Bromus inermis Leyss), reed canarygrass (Phalaris arundinacea L.), and Rough bluegrass (Poa trivialis L.) were employed. Soil covered with a dense sod of Kentucky bluegrass supported an infiltration rate that was 2.4 times more than tall fescue. Tall fescue yielded the best and removed the most N, P, K, Mg and Ca from the system. Cylindrical monoliths 7.6 X 152 cm of a Sassafras sandy loam were used to show that continuous flooding with poultry processing wastewater greatly decreased internal drainage. Soils receiving intermittent irrigating renovated more wastewater than flooded soils. In this soil iron reducing and sulfur forming microorganisms may be the reason for a great reduction in internal drainage when soils are continuously flooded with poultry processing wastewater or sugar water.
W76-06811

PREPLANNING MINING OPERATIONS TO REDUCE THE ENVIRONMENTAL IMPACT OF MINE DRAINAGE ON STREAMS,
Union Carbide Corp., Tarrytown, N. Y. Aquatic Environmental Sciences.
For primary bibliographic entry see Field 5G.
W76-06939

IMPACT OF ARGO TUNNEL ACID MINE DRAINAGE, CLEAR CREEK COUNTY, COLORADO,
Colorado School of Mines, GoldenDept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
For primary bibliographic entry see Field 5G.
W76-06943

CHEMICAL KINETICS OF NEUTRALIZATION OF ACIDIC WATER BY CRUSHED LIMESTONE,
Pennsylvania State Univ., University Park Inst. for Research on Land and Water Resources.
F. H. Pearson, and A. J. McDonnell.
In: Water Resoruces Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 85-98. 5 fig, 8 ref.

Descriptors: *Neutralization, *Limestones, *Acid mine water, *Chemistry, Chemical reactions., Environmental engineering.
Identifiers: *Chemical kinetics.

Crushed limestone is usually the cheapest reagent for the neutralization of acid wastes. To provide for the rational design of limestone neutralization processes, the kinetics of the chemical reactions involved were evaluated by experiment, and an analysis was made of the chemical and physical boundary conditions that control the extent to which the reactions are completed. The rate limiting reactions are the attack of limestone by hydrogen ions, and the exsolution of carbon dioxide which is thereby generated; the latter reaction has an increasing effect on process efficiency above pH 5. Rate constants for the limiting reactions were evaluated each as a function of temperature, ionic strength, water turbulence, and for the first reaction bicarbonate ion concentration, which catalyzes the attack of limestone by hydrogen ions. A mathematical model of limestone neutralization processes reproduced experimental data. (See also W76-06938) (Sims - ISWS)
W76-06946

APPLICATION OF A 500 KEV ELECTRON ACCELERATOR TO THE CONTINUOUS IRRADIATION OF LIQUIDS, ESPECIALLY WASTE WATERS (ANWENDUNG EINES 500-KEV-ELEKTRONENBESCHLEUNIGERS ZUR KONTINUIERLICHEN BESTRAHLUNG VON FLUESSIGKEITEN, INSBESONDERE ABWAESSERN),
Technische Hochschule, Vienna (Austria). Institut fuer Allgemeine Chemie.
R. Wiesboeck, and E. Proksch.
Kerntechnik, Vol. 18, No. 1, p 20-28, 1976. 8 fig, 4 tab, 23 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Irradiation, Gamma rays, Disinfection.
Identifiers: Electron accelerator.

Ionizing radiation has been used to decompose various classes of substances in industrial waste waters including phenols, dyestuffs, pesticides, PCBs, detergents, and cyanides. However, economic applications of gamma radiation have not appeared feasible because the sources of gamma radiation for the treatment of large flow rates are too expensive. The construction and operation of an experimental plant for the irradiation of large liquid volumes at high efficiency using low electron energies are described. The liquid to be treated is passed over an irradiation plate normal to the scanner deflection through the electron beam. The electron accelerator voltage is 500 kV, and the electron current can be controlled over the range 0 to 25 mA. A homogenous irradiation of water in layer thicknesses much greater than the average depth of penetration of the electrons was observed. An explanation of this phenomenon is the indirect radiation effect of an approximately uniform mechanical mixing of the liquid during the irradiation achieved in the present irradiation equipment by turbulent flow. This experimental setup was used to treat dyeworks effluents and cyanide containing water. Capital and operating costs for an hypothetical 40 cu m irradiation plant were estimated to be less than or comparable to treatment with activated carbon. Irradiation with low energy level electrons appears to be a technologically and economically viable treatment method for colored waste waters. (Orr-FIRL)
W76-06957

REMOVAL OF HALO-HYDROCARBONS FROM WATER.
French Patent FR 2261-986. Issued October 24, 1975. Derwent French Patents Abstracts, Vol. W, No. 50, p F2, January 20, 1976.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Patents, Organic compounds, Evaporation, Oil wastes.
Identifiers: Halo-hydrocarbons.

A method for the removal of halo-hydrocarbons from waste water from textile finishing operations has been patented. The halo-hydrocarbons, such as perchloroethylene, are removed by evaporation as azeotropes into a stream of air. The effluent is kept in a residence zone in which the gas phase in contact with the water is repeatedly renewed. This method provides a simple way of obtaining a non-toxic effluent suitable for discharge to the sewer system. The water may be mechanically mixed by a stirrer while in the residence zone or the gas phase may be injected into the water to increase the contact surface. Heating the water will reduce the time necessary for effecting purification. (Orr-FIRL)
W76-06958

THE CONTROL OF ENVIRONMENTAL PROBLEMS IN THE SWISS TEXTILE REFINING INDUSTRY (DIE BEWAELTIGUNG VON UMWELTPROBLEMEN IN DER SCHWEIT-

ZERISCHEN TEXTILEVEREDELUNGSINDUSTRIE),
W. Schefer.
Forum Umwelthygiene, Vol. 2, No. 2, p 46-49, February, 1976. 2 fig, 1 tab, 16 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Toxicity, Analytical techniques, Environmental effects.
Identifiers: Switzerland.

A committee of textile technologists and environmentalists has been formed within the Swiss textile industry. The committee is charged with formulating practical solutions to environmental problems affecting the textile industry, such as the elimination of non-degradable or toxic chemicals in waste water. Two test methods of the Swiss testing institute (EMPA) are discussed. (Orr-FIRL)
W76-06959

PURIFYING NEUTRAL WASTE WATER CONTG. DYES.
Netherlands Patent NL 7506-370. Issued December 2, 1975. Derwent Netherlands Patents Report, Vol. W, No. 51, p D2, January 27, 1976.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Dyes, Textiles, Ozone, Oxidation.
Identifiers: Dyeing wastes.

A method for treating dye-works effluents so that they are suitable for recycling has been patented. Neutral waste water containing organic dyes and auxiliary agents is subjected to continuous oxidative degradation in several stages with strong agitation. Ozone is used as the oxidizing agent. The amount of ozone applied is adjusted according to the duration of treatment and the oxidation parameters in each stage. This process provides for continuous operation with optimum use of ozone. No supplemental purification processes are required for complete degradation of the dyes and a wide range of dyes/auxiliaries can be degraded. Economical efficiency is assured due to the optimal use of ozone. (Orr-FIRL)
W76-06960

WASTE WATER NEUTRALIZATION WITH FLUE GAS (ABWASSER-NEUTRALISATION MIT RAUCHGAS),
A. Herren.
Textilveredlung, Vol. 11, No. 2, p 71-72, 1976.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Construction, Treatment facilities, *Neutralization.
Identifiers: *Flue gas, Dyehouse effluents.

German water protection authorities require that the effluent from dyehouses be neutralized prior to release to the sewers for treatment in regional effluent treatment plants. Cotton dyeing plants with predominantly alkaline effluents are beginning to use stack gas for the neutralization process. The construction and operation of an existing plant of Zofingen AG is described. The plant has been relatively trouble-free from its inception, and runs with a minimum of supervision, almost automatically. (Orr-FIRL)
W76-06961

IS COLLECTIVE WASTE TREATMENT THE ANSWER TO 1983,
H. W. Reiner.
Plating and Surface Finishing, Vol. 63, No. 2, p 11, 14-15, February, 1976.

Descriptors: *Waste water treatment, *Metals, *Industrial wastes, Treatment facilities, Waste water disposal, Recycling.
Identifiers: *Plating industry.

The use of collective waste treatment facilities for small job shops in the plating industry is discussed. With new federal effluent limitations planned for 1977 and the expected stricter enforcement of sludge and hazardous waste disposal requirements, such as treatment and disposal may be the only economically feasible solution. Presently, three major firms provide treatment and disposal services to platers. These are Liqwacon Corporation of Thomaston, Connecticut, Rollins Environmental Services, of New Jersey, Louisiana, and Texas, and Chem-Trol Pollution Services, Incorporated, near Buffalo, New York. These firms analyze a customer's sample before quoting a price for treatment and disposal. This price includes a per gallon charge, depending upon concentration, composition, and packaging of the waste, plus a transportation fee. Another collective waste treatment concept is to pipe the wastes directly from each plating shop to a centralized treatment facility. At the Mitchel Field Industrial Park near Levittown, Long Island, such a system is planned. The developer will build plant facilities to suit tenant platers in order to provide an economical method in compliance with federal, state, and effluent guidelines. Other suggestions for collective treatment have been made, including the pooling of resources by small job shops in a joint venture to recover sodium dichromate or chromic acid from their rinsewaters, which could then be sold to other industries. (Kramer-FIRL)
W76-06962

ELECTROLYTIC FLOTATION TREATMENT FOR HARMFUL HEAVY METAL WASTE WATER (YUGAI JUKINZOKU HAISUI NO DENKAI FUJOSHORI),
M. Ishii.
PPM, Vol. 7, No. 1, p 52-54, January, 1976. 18 fig, 5 ref.

Descriptors: *Industrial wastes, *Waste water treatment, Metals, *Heavy metals, *Electrolysis, *Flotation, Nickel.
Identifiers: *Plating waste waters.

Waste water treatment for heavy metals removal by the metal electrolytic flotation (MEF) method is described. The MEF method consists of three baths: an aluminum electrolytic bath, a coagulation bath, and a flotation bath. The method has been applied to the treatment of waste water from various types of factories, such as cadmium plating, photographic film processing, nickel plating, and metal cutting machinery. The MEF method allows the removal of heavy metals to lower concentration levels than does a simple precipitation method with pH adjustment. Waste water treatment can be made at a constant pH, and therefore involves no solution pH adjustment process. The method can also be used to remove oil components from water. If dissolved metal ions can be removed easily from the waste water by a simple pH admustment, such removal prior to the MEF treatment will help consume less electricity. For example, in treating cadmium plating waste water, cyanides in the water are treated by the alkaline chloride method, while the reduction of chromium is made by the sulfite salt method. The two treated waters are then combined for further treatment by the MEF method. When waste water from a photographic film processing factory with pH 7.9 was treated by both the pH adjustment precipitation method and the MEF method, the cadmium level in the treated water decreased to 0.72 ppm and 0.008 ppm with 20 minute and 40 minute MEF treatments, respectively. The former method alone could only reduce the cadmium level to 0.50 ppm at pH 11.2. MEF treated waste water from a metal cutting machinery factory had an oil content of less than 2 ppm, Cu 0.2 ppm, and Zn 0.2 ppm; the raw water had contained 35,000 ppm oil, 850 ppm Cu and 20 ppm Zn. (Katayama-FIRL)
W76-06963

EPA GRANT HELPS DETERMINE THE FEASIBILITY OF RECYCLING CYANIDE ZINC PLATING SLUDGE,
Industrial Finishing, Vol. 52, No. 2, p 26-30, February, 1976.

Descriptors: *Industrial wastes, *Waste water treatment, *Sludge treatment, *Metals, *Zinc, Treatment facilities, Grants, Costs, Recycling, Feasibility studies.
Identifiers: *Cyanide zinc plating sludge.

A pilot feasibility study was conducted at the Metal Plating Corporation, Connersville, Indiana, with the help of an EPA grant. The study investigated the recycling of cyanide zinc plating sludge. The complany treats zinc plating dragout with the Du Pont Kastone (peroxide and proprietary chemicals) process, then returns filtered sludge to the zinc plating bath. Following production and cyanide treatment, a conical boot at the bottom of the cyanide treatment tank collects about 70 gal of sludge. This is then pumped into a 300-gal secondary settling tank, where 20-30 gal clear liquid is removed by siphoning after overnight settling. The sludge, which contains 3-4% solids, is filtered and further concentrated. In the feasibility study, four to five filtering cycles were required, and the process was labor-intensive. When the plant is scaled-up from pilot to production, only one large filter will be required to dissolve entrapped solids. The sludge solids concentration after filtering will increase to 40-50%. No buildup of sludge cakes has been found to occur on the bottom of the plating tank. After one year of testing, the benefits of recycling were noted to be the elimination of sludge storage and handling, and a decrease in zinc anode consumption by 10 to 30%. Cost figures from the feasibility study indicated that the savings were approximately equal to the labor required for sludge recycling. On a full-scale system, however, labor costs will be reduced, providing a decrease of costs in the long run. (Kramer-FIRL)
W76-06964

SLUDGE FILTER HELPS MEET DISCHARGE REQUIREMENTS,
Industrial Wastes, Vol. 22, No. 1, p 30-31, January/February, 1976. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil wastes, Metals, Separation techniques, Sludge treatment, Filters.
Identifiers: *Vacu-matic sludge filter.

A new Vacu-matic sludge filter, now on stream at International Harvester's East Moline, Illinois, waste water treatment plant, has helped to meet NPDES permit conditions by discharging clean water and dewatered sludge. Wastes at the plant contain water soluble coolant from the machine shop, sawing and cut off operations, and heavy stock drilling; water from automatic parts washers; water from spray booths; spent caustic stripping solutions; and heavy machinery oils. With the new sludge filter, the facility processes 54,000 gallons of contaminated liquid every 24 hours, operating on a batch basis. Liquid is channeled to collection tanks, then piped to two 18,000 gallon settling tanks. A flotation separator skims sludge particles from the surface. Lime, alum, and anionic polyelectrolyte are added for pH control, breakdown of oil, and agglomeration and compaction of sludge particles. The Hoffman Vacu-matic sludge filter is then used for the dewatering process. This filter has an extended vacuum ramp to hold the cake under the influence of the vacuum chamber and air flow for a longer period of time, achieving a lower moisture content. The Vacu-matic delivers a dry cake, which is easily separated from the media prior to disposal. (Kramer-FIRL)
W76-06965

METHOD OF BIOLOGICAL PURIFICATION OF INDUSTRIAL EFFLUENTS FROM CHROMATES AND BICHROMATES,
V. I. Romanenko, S. I. Kuznetsov, and V. N. Korenkov.
United States Patent 3,941,691. Issued March 2, 1976. Official Gazette of the United States Patent Office, Vol. 944, No. 1, p 338, March, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Biological treatment, Municipal wastes, Anaerobic conditions, Chromium.
Identifiers: Chromates, Bichromates, Municipal-industrial wastes.

A biological method for the purification of combined industrial and municipal waste waters has been patented. Industrial effluents containing chromates and bichromates are mixed with domestic sewage. A culture of Bacterium decromaticans Romanenko B-1167 microorganisms is added to the effluents. Anaerobic conditions are maintained in the mixture until substantially complete reduction of the chromates and bichromates to chromium hydroxide is achieved. The culture is then separated from the purified water. (Orr-FIRL)
W76-06966

BIODEGRADATION OF POLYVINYL ALCOHOL IN WASTEWATER,
Du Pont Co., Wilmington, Del.
Q. D. Wheatley, and F. C. Baines.
Textile Chemist and Colorist, Vol. 8, No. 2, p 28-33, February, 1976. 6 fig, 6 tab, 30 ref.

Descriptors: *Industrial wastes, *Municipal wastes, *Waste water treatment, Textiles, *Biodegradation, Kinetics, Activated sludge, Biological treatment, Water quality control.
Identifiers: *Polyvinyl alcohol, Municipal-industrial wastes.

The use of polyvinyl alcohol (PVA) as a warp size for synthetic and cotton-synthetic blends in textile finishing operations is increasing. An investigation was conducted to assess the effect of PVA on municipal waste treatment systems by measuring the kinetic parameters for PVA biodegradation in an acclimated domestic waste activated sludge situation. Analysis of the data obtained from operating a laboratory scale completely mixed activated sludge process (CMAS) with domestic sewage mixed liquors inoculated with a microbial culture fully acclimated to PVA indicated that PVA removal greater than 90% and COD removals greater than 80% can be achieved when the product of the biomass solids and retention time is less than 1.3 g-day/liter and the total loading is less than 0.35 (lb COD/lbMLSS)/day. Eckenfelder's model was used to analyze the PVA continuous biodegradation data. Removal rate coefficients for PVA and COD were determined to be 1.2 liter/gal-day and 1.1 liter/g-day, respectively. It is concluded that PVA will not cause problems in meeting 1977 EOA goals for textile mills handling complex operations with blends; however, additional technology will be required to meet 1983 regulations. (Orr-FIRL)
W76-06967

FLOATING AERATORS IN AUSTRALIA,
Water Services, Vol. 80, No. 959, p 36, 38, January, 1976.

Descriptors: *Waste water treatment, *Flotation, *Aeration, Equipment, Lagoons, Industrial wastes, Pulp and paper industry, Odor, *Australia.
Identifiers: Aerators.

The installation of Ames Crosta Simplex floating aerators solved an odor and biological growth problem for the town of Myrtleford, Victoria, Australia. The town's sewerage and the effluent from a paper mill is discharged into a primary and secondary lagoon system. The surface of the primary lagoon had become covered with a floating, fibrous mass and a serious odor problem was present. Three weeks after the installation of six 15 kW Simplex floating aerators, the floating material and associated odor had disappeared. The effluent from the secondary lagoon improved in quality after the aerators were installed. BOD was reduced from 160 mg/liter to 45 mg/liter and suspended solids were reduced from 400 mg/liter to 21 mg/liter. (Orr-FIRL)
W76-06968

SELECTING A MILL EFFLUENT TREATMENT SYSTEM--SOME CONSIDERATIONS.
Brown and Root, Inc., Houston, Tex.
D. R. Johnson.
Tappi, Vol. 59, No. 2, p 140-144, February, 1976, 2 fig, 3 tab.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Industrial wastes, Oxidation, Biological treatment, Activated sludge, Suspended solids, Biochemical oxygen demand, Treatment facilities.

The selection of an effluent treatment system for a particular pulp and paper mill includes considerations of space availability, regulatory agency requirements, climate, site topography, existing treatment facilities, the type of manufacturing process, and the total cost of the system. The aerated lagoon and activated sludge system are discussed in terms of their basic operating characteristics, and advantages or disadvantages of the two systems in pulp and paper mill applications are compared. The advantages of activated sludge systems include: the relative compactness; the inherent heat conservation; and, the capacity for adjustment to unanticipated or unusual waste characteristics by manipulation of the mixed liquor suspended solids level to adjust the F:M ratio to compensate for changing influent conditions. Disadvantages of activated sludge are the sensitivity to a shock load, the excess sludge generation, and the general sensitivity, or tendency to behave abnormally for no apparent reason. The advantages of aerated lagoon treatment include a very substantial ability to absorb pH and/or BOD shocks without upset and a general stability that is 'built-in' during the design and construction stages and is unaffected by operational changes. However, aerated lagoons are greatly affected by temperature variations. In conclusion, the activated sludge and aerated lagoon systems will both produce good quality effluents. A well designed aerated lagoon system will be simple, efficient, and predictable, while an activated sludge system must be knowledgeably operated to be efficient, and is not a simple system. The cost-efficiency of an aerated lagoon system decreases as the ambient temperature decreases, but an activated sludge operation is essentially climate independent. (Orr-FIRL)
W76-06969

CHEMICALS FROM THE PULP INDUSTRY,
Paper, Vol. 185, No. 1, p 19, January 5, 1976.

Descriptors: *Pulp and paper industry, *Chemical wastes, *Recycling, Sulfite liquors, *Waste water treatment, Industrial wastes, Sulfates, Chemical industry, Treatment facilities.

The pulp and paper industry has been steadily increasing its use of chemicals in its manufacturing processes while at the same time the production of chemicals from pulp and paper effluents has been increasing. These trends indicate increased cooperation between the pulp and paper industry and the chemical industry. Reuse of pulp and paper waste includes production of Torula yeast at the Salem, Oregon, plant of Boise Cascade. The Rhidelander, Wisconsin, plant of St. Regis Paper Company also produces Torula yeast. About 25,000 tons of desugared calcium lignosulfonate are manufactured yearly from pulping wastes. Lignosulfonate is used in vanalin production, oil well drilling muds, as concrete additives, and as dispersing agents. Cellulose Attisholz AG, Uterbach, Switzerland, produces about 5,000 tons of Torula yeast from spent sulfite liquor, as well as lignosulfonates, alcohols, methanol, furfural, and cymene. Finnish pulp and paper manufacturers are producing Pekilo-proteins in addition to Torula yeast from their effluents. Recovery of ethanol, methanol and acetic acid, and the production of furfural from hardwood chips are also practiced at Finnish plants. (Orr-FIRL)
W76-06970

PURIFICATION OF WASTE WATER FROM PAPER INDUSTRY,
S. A. Puzyrev, M. A. Evilevich, and Yu. I. Chernousov.
Soviet Patent SU-446-266. Issued May 3, 1975. Soviet Inventions Illustrated, Vol. W, No. 48, p D1, January 1976.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Patents, *Industrial wastes, Flocculation, Chemical precipitation, Sulfates, Coagulation.

A method for the purification of waste water from the production of cellulose paper has been patented. The effluent is first treated with a coagulant and the precipitate formed is removed. The pH of the water is then adjusted to 2-3 with acid, and a flocculant is added. The floc formed is then removed. Waste water from sulfate cellulose pulp processing was treated with a coagulant containing aluminum sulfate to precipitate the suspended lignin. After the precipitate was removed, H_2SO_4 was added to adjust the pH to 2-3. A flocculant, polyacrylamide, was added in an amount equal to 20-25 mg/g preciptate (on a dry weight basis). The precipitate from this step was removed and aluminum sulfate was again added to the water as a coagulant. The consumption of the coagulant decreased 3.0-3.5 times and the volume of the precipitate increased about 4-5 times. (Orr-FIRL)
W76-06971

THE ELECTROCHEMICAL TREATMENT OF INDUSTRIAL WASTE SOLUTIONS AND SEWAGE,
L. Redey, I. Kovacs, and I. Zorkoczy.
International Chemial Engineering, Vol. 16, No. 1, p 30-37, January, 1976. 4 fig, 20 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Electrolysis, Pilot plants, Treatment facilities, Iron, Oil wastes, Separation techniques, Electrodialysis.
Identifiers: Electrochemical treatment.

Electrochemical treatment is becoming an increasingly important treatment means for industrial wastes and sewage. A review of electrochemical methods and some actual examples are presented. Electroflotation is the process in which the coagulation of colloid solutions, suspensions, emulsions, and the floating of such agglomerates is facilitated by the evolution of gaseous hydrogen or oxygen at the electrodes. Electroflotation is being used to treat oily water from steel works, water containing paints or fibrous materials, and sewage. The alkalinization of the cathode space may enhance the formation of a hydroxide precpitate from the waste water being treated. Electrodialysis represents an electrochemical technqiue useful for such applications as reducing the salt content of the rinse water from galvanizing plants. Electrolysis is useful technique for the recovery of copper, silver, and sulfuric acid in metal finishing operations. Washing with an alkaline solution is widely applied in the petroleum industry to reduce the sulfur content of gasoline distillates. The spent solution, containing large amounts of sulfur compounds (mercaptans), can be regenerated and the sulfur compounds recovered by electrochemical processes. A schematic diagram of an alkaline

gasoline desulfurizing and washing solution regeneration system is presented. (Orr-FIRL)
W76-06972

RENOVATION TO MEET POLLUTION RULES COST TOM RABE $60,000,
National Petroleum News, Vol. 68, No. 3, p 60-61, March, 1976.

Descriptors: *Oil industry, *Oil spills, *Waste water treatment, *Industrial wastes, Water pollution control, Legislation, Treatment facilities.
Identifiers: Renovation, Oil spill prevention.

In order to comply with the Federal spill prevention control regulatons (SPCC), Albemarle Oil Company, Albermarle, N.C., a jobber for AMOCO, spent $60,000 remodeling an 18 year old bulk plant. The original facilities, including three 20,000 gal tanks for regular, on 20,000 gal tank for premium, two 15,000 gal tanks for diesel fuel, and tw 10,000 gal tanks for kerosene, were situated on a one-acre plot. An adjoining two acres were purchased. The existing storage was moved about 150 feet, two 30,000 gal vertical tanks for distillate storage were added, and a new top-loading rack was built. The tanks were drained of product, which was temporarily stored in tanks at old stations, and then lifted by crane to their new locations. Concrete pads were built in front of the storage area and the new rack to catch any spillage. Catch basins on the pads are connected to a 2,000 gal skimmer-type oil/water separator. The new work will enable the company to avoid any fines for non-compliance with the SPCC regulations. (Orr-FIRL)
W76-06973

SOME PROBLEMS OF THE INVESTIGATION OF WASTE WATERS GENERATED IN THE PETROLEUM INDUSTRY (KOOLAJIPARI SZENNYVIZEK VIZSGALATANAK NEHANY KERDESE),
For primary bibliographic entry see Field 5A.
W76-06974

PETROLEUM AND OIL WASTES DEGRADATION.
Belgian Patent BE 832-298. Issued August 11, 1975. Derwent Belgian Patents Abstracts, Vol. X, No. 2, p D3, February, 1976.

Descriptors: *Oil wastes, *Waste water treatment, *Industrial wastes, Biodegradation, Microorganisms, Biological treatment, Filtration, *Patents.

A method for the biodegradation of petroleum and oily wastes has been patented. An aqueous mixture of the effluent and a microorganism along with necessary nutrients are introduced into an aerated degradation system. The mixture is then passed to a second degradation system where a different microorganism is added. The microorganisms which might be used include various strains and mutants of Candida parapsiloxis, C. tropicatis, C. utilis, Aureobasidium pullulans, Myrothecium verrucaria, Cladosporium cladospoporiooides, Saccharomyces cerevisiae, Asperiguillus sp., Phodotorula sp., Candida lipolytica, Nocardia corallina, N. globerula, N. opaca, N. rubra, N. paraffinae, or Pencillium sp. Several tanks may be employed in each degradation stage, and filtration may be performed after each stage. (Orr-FIRL)
W76-06975

REMOVING PETROLEUM PRODUCTS FROM EFFLUENT WATER,
Soviet Patent SU 466-029. Issued July 11, 1975. Soviet Inventions Illustrated, Vol. X, No. 6, p D4, March 17, 1976. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Oily water, Oil wastes, Separation techniques, *Patents, Equipment.
Identifiers: *Oil-water separator.

A method for removing petroleum contaminants from effluents has been patented. Preliminary cleaning of the effluent is accomplished by removing mechanical impurities on a vibrating sheet filter. The effluent is further cleaned by passing through a series of filter elements fitted with drainage pipes. The waste water is fed into a section of the cascading filter which contains floating polyethylene pices. After complete saturation, the petroleum droplets begin to coalesce and pass downwards into a storage tank. Oil can be withdrawn from this tank for reuse. The water passes down the filter and enters a space between the body of the filtering element and a coaxial screen. It then passes through the holes in the screen into the space under the drainage screen, flows through the filter cloth, and into the next lower stage. The process is repeated until the residual oil is separated from the water. All of the filter elements may be used at the same time, or some may be removed from service for cleaning. (Orr-FIRL)
W76-06976

OIL SPILL CONTROL, PART 1: PREVENTION,
Pace Co., Houston, Tex.
For primary bibliographic entry see Field 5G.
W76-06977

WATER POLLUTION CONTROL, MID-COURSE CORRECTION,
Texaco, Inc., Beacon, N.Y. Environmental Protection Dept.
For primary bibliographic entry see Field 5G.
W76-06978

APPROACH TO ENTIRELY CLOSED BOARD MILL BY ACTIVATED CARBON ADSORPTION (ITAGAMI KOJO NI OKERU KASSEITAN NI YORU HAISUI SHORI NI TSUITE),
R. Kimura, and K. Izumisawa.
Kamipa Gikyoshi, (Japan Tappi) Vol. 30, No. 1, p 20-26, January, 1976. 4 fig, 5 tab.

Descriptors: *Pulp and paper industry, *Industrial wastes, *Wastewater treatment, *Activated carbon, Activated sludge, Filters, Suspended solids, Biochemical oxygen demand, Effluents, Absorption.

Activated carbon adsorption treatment for waste water from a used-newspaper treating mill is described. Since activated sludge treatment was incapable of producing an effluent suitable for discharge, activated carbon was employed in the mill. The treatment system included a clarifier and two rapid sand filters. The effluent from these units was then passed through activated carbon towers. The sytem removed an average of 79.8% of the COD from the raw waste water, reducing the average COD level in the treated water to 9.2 ppm. Suspended solids and BOD levels in the treated water were also less than 10 ppm. The activated carbon was regenerated at 910 C to 930C. The loss of carbon be each regeneration was about 10%, and the regenerated carbon had the same adsorptive characteristics as the virgin carbon. Sulfur generation was observed in the treated water when operation of the system was extended, perhaps due to the presence of bacteria which reduce sulfate to sulfur. To eliminate this phenomenon, the tower was rinsed with sodium hydroxide every 10 to 11 days of operation. Carp and goldfish were raised in the treated water, and no difference in their growth was observed from fish raised in control situations. (Katayama-FIRL)
W76-06979

COATING FACTORY'S GROUPING IN THE CITY AREA AND ENVIRONMENTAL POLLUTION CONTROL (KISEI SHIGAICHI NI SONRITSU SURU MEKKI KOJO NO SHUDANKA TO KOGAI TAISAKU),
M. Oide, A. Morishima, and S. Nomura.
Kagaku Kojo, Chemical Factory, Vol. 20, No. 3, p 41-45, March, 1976. 6 fig.

Descriptors: *Industrial wastes, *Waste water treatment, *Chromium, *Metals, Treatment facilities, Separation techniques.
Identifiers: Japan, Cyanide wastes, Plating effluents.

The redistribution of seven metal plating factories in Kobe City, Japan, is described. These factories had been scattered throughout the city, and were relocated into one building for collective treatment and improved pollution control. Waste waters from each factory were collected into baths, separated into cyanide, chromium, alkaline, and acid solutions. The cyanide solution was treated by oxidation, reduction, and neutralization, before being channelled into a bath for pH adjustment. The chromium solution was treated with $Na_2S_2O_5$ and H_2SO_4, then passed into the same pH adjustment bath. The pH adjustment of the collected solution was accomplished in two steps, including flocculation. After the filtration of the flocculated materials, the solution was neutralized with H_2SO_4 before final discharge into the public drainage system. The total amount of waste water generated from the factories was 416.6 cu m per day; the treated water had a pH between 5 and 9. Suspended solids of the treated water were less than 80 mg/liter, total CN less than 0.7 mg/liter, total chromium less than 1.9 mg/liter, Cr(+6) less than 0.35 mg/liter, Cu less than 3 mg/liter, Zn less than 5 mg/liter, and Fe less than 10 mg/liter. (Katayama-FIRL)
W76-06980

TREATMENT OF WASTE WATER BY IMMOBILIZED ACTIVATED SLUDGE (KOTEIKA KASSEI ODEN NI YORU HAISUI SHORI),
K. Hayakawa.
Mizushori Gijutsu, (Water Purification and Liquid Wastes Treatment), Vol. 17, No. 1, p 53-62, 1976. 22 fig, 6 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Activated sludge, Ozone, Biochemical oxygen demand, Color.
Identifiers: Dyeing wastes.

Waste water treatment by immobilized activated sludge was studied and its application for dyeing factory waste water tested. The fixation of activated sludge on polyurethane sponge, polypropylene synthetic cotton, polyethylene sponge, and polyethylene thread was examined. All of the substrates could retain more than 3000 ppm sludge/liter. Polypropylene synthetic cotton retained the highest sludge concentration, approximately 13,000 ppm sludge/liter. Waste water from a dyeing factory was treated with activated sludge fixed on polyurethane sponge. More than 24 hours of aeration was required to remove 90% of the 300 ppm BOD in the raw water, however, three hours of aeration were sufficient to obtain a 100 ppm level of BOD in the treated water. COD removal efficiency was 40% and 70% after 1.5 and 48 hours of aeration, respectively. The treated water has a pH of 7-8, compared to a raw water pH of 10. The color intensity measured at 280 nm decreased to 10-60% of the color intensity of the raw water; intensity at 500 nm decreased to 10-80% of the original. Decolorization efficiency increased with increased aeration time, but not significantly. Although this treatment was sufficient to reduce the BOD to acceptable levels, it was necessary to inject ozone to the aeration bath in order to achieve acceptable COD values. (Katayama-FIRL)
W76-06981

HYDROGEN PEROXIDE FOR WASTEWATER TREATMENT,
W. H. Kibbel, Jr.

Public Works, Vol. 107, No. 1, p 60-62, January, 1976. 1 fig, 1 tab.

Descriptors: *Waste water treatment, Activated sludge, Odor, Biochemical oxygen demand, Suspended solids, Tanks, Safety, Chemicals, Transportation, Physical properties, Chemical properties.
Identifiers: *Hydrogen peroxide.

An increased usage of hydrogen peroxide in municipal waste water treatment has been noted. While the primary function of H2O2 is the removal of sulfide-caused odors, it also controls sludge bulking in activated sludge systems. When added to collection mains upstream from a treatment plant, hydrogen peroxide has provided additional dissolved oxygen to the plant influent and has improved plant efficiency in the removal of suspended solids and BOD. The physical and chemical properties of hydrogen peroxide are detailed and safety precautions for its handling are provided. Hydrogen peroxide is stable when stored properly, but contaminants, such as heavy metals and their salts, must be kept from entering storage containers and tanks and thus increasing the decomposition rate. Shipping equipment for H2O2 includes tank trucks, drums, and tank cars. Storage should be only in the original container and adequate ventilation and ample water for washing in the cases of accidental spillage should be provided. (Kramer-FIRL)
W76-06982

USING CORRUGATED STEEL TO SLASH SEWER COST BY 12%,
B. Jones.
Engineering and Contract Record, Vol. 88, No. 10, p 28-29, 32, October, 1975. 1 fig.

Descriptors: *Pipes, *Sewers, *Construction materials, *Steel, Pipelines, Waste disposal, *Construction costs, Joints(Connections), Asphalt.
Identifiers: Armco coupler, *Storm sewers.

Twin conduits of corrugated steel pipe have been installed in the construction of a 518 m storm sewer for the City of Beltsville, Ontario. The use of this construction material, rather than reinforced concrete, resulted in a costs saving of $50,000. The 12-gauge steel pipe, called Smooth-Flo, has spiral configurations with a lock seam. Two annular corrugations were rolled into helical corrugations at each end of the pipe so that a coupling system could be accommodated. A coating of asphalt was spun onto the inside pipe surface after fabrication in order to improve hydraulic characteristics. Because the pipe is flexible, crushed stone laid to a minimum of 15 cm had to be compacted to cover the grade before the pipe could be bedded. Once in position, O-ring gaskets were installed and special Armco couplers were bolted together, providing a joint with low infiltration and exfiltration rates. (Kramer-FIRL)
W76-06984

GETTING THE MOST OUT OF AN INFILTRATION/INFLOW ANALYSIS,
Texas Water Quality Board, Austin.
R. S. Jones, and D. W. Nelson.
Public Works, Vol. 106, No. 12, p 50-53, December, 1975. 1 fig, 5 ref.

Descriptors: *Infiltration, *Inflow, *Cost analysis, *Sewers, *Waste water treatment, Waste disposal, Operating costs, Maintenance costs, Repairing.
Identifiers: Infiltration/inflow, Cost effectiveness.

Suggestions for compliance with the infiltration/inflow (i/i) requirements of the Construction Grants Program are presented. The accepted definition of excessive infiltration/inflow is the quantities of i/i which can be economically eliminated from a sewer system by rehabilitation. The term 'excessive' has a purely economic meaning, and the determination of whether or not a sewer system is subject to 'excessive' infiltration/inflow must be based on a cost-effective analysis comparing the alternatives of transportation and treatment to a combination of survey, rehabilitation, and transportation and treatment of the remaining extraneous flows. Commonly misunderstood legal requirements include: the provision that all flows within the service area throughout a 20-year planning period must be accounted for; the computation of the interest rate for amortization and present worth comparisons of operational and maintenance costs at 6 1/8%; and the correlation of the estimated rehabilitation costs with the flow rates and conditions observed in each individual sub-system. (Kramer-FIRL)
W76-06985

COATING IMMERSED CONCRETE FOR SWIMMING POOLS AND SEWAGE INSTALLATIONS,
For primary bibliographic entry see Field 8F.
W76-06987

FINE SIEVING DRUM FOR SOLID MATTER SUSPENDED IN WATER.
French Patent FR 2255-936. Issued August 29, 1975. Derwent French Patents Abstracts, Vol. W, No. 42, p D2, November, 1975.

Descriptors: *Patents, *Suspended solids, *Sewage treatment, *Separation techniques, *Waste water treatment, Equipment.
Identifiers: Sieving drums.

A patent has been issued for a fine sieving drum to treat solids suspended in water from sewage digestion tanks. The suspension is fed into the drum which has sealed end faces, rotating within an enclosed vessel. Clarified water is passed through woven wire mesh covering the drum; the solid matter is carried to a zone vertically above the axis of the drum. A higher pressure exists within the drum to prevent the solid matter from falling back into the sieve pool. This pressure, which holds the solids on the sieve without destroying the film of water across the holes, varies from 2.5 mm and 150 mm water column. The process is capable of achieving an effluent with 10 ppm of suspended solids. (Kramer-FIRL)
W76-06989

SETTLING TANKS.
South African Patent ZA 7303-195. Issued July 31, 1975. Derwent French Patents Abstracts, Vol. W, No. 42, p D1 November, 1975.

Descriptors: *Patents, *Sludge treatment, *Sludge disposal, Tanks, Equipment, Waste water treatment.
Identifiers: Sludge concentration, *Settling tanks.

The design of a settling tank has been patented. The tank has a flat base and a wall surrounding the base. Liquid to be treated is fed to a lower portion of the tank where a sludge blanket is maintained. A sludge concentrating receptacle is also located within the lower portion of the tank and defines a quiescent zone. The receptacle has an inlet above the base of the tank where sludge particles are received from the surface of the sludge blanket. An outlet discharges concentrated sludge from the receptable. (Kramer-FIRL)
W76-06990

INCINERATOR AND SYSTEM FOR CLEANING PRODUCTS OF COMBUSTION,
For primary bibliographic entry see Field 5E.
W76-06991

CORRUGATED DRAIN PIPE.
Soviet Patent SU 393400. Issued April 18, 1975. Soviet Inventions Illustrated, Vol. W, No. 42, p 1, November, 1975. 1 fig.

Descriptors: *Patents, *Drains, Equipment, *Pipes, Flow rates, Construction materials, Filtration, Waste water treatment.
Identifiers: Corrugated drain pipes.

A patent has been granted for a corrugated drain pipe. The pipe has water openings at a vee-top and unequal chutes to increase strength and prevent blockage. Chutes are formed by the vee and space below the vee is filled with filtering material. One chute is provided for smaller effluent flows. Effluent is filtered through the filtering material when flow increases so that the first chute becomes full, water overflows to the second chute. The corrugations outside the pipe increase its strength. (Kramer-FIRL)
W76-06993

CLARIFIER WITH FLOATING FILTERING MATERIAL.
French Patent FR 2255-935. Issued August 29, 1975. Derwent French Patents Abstracts, Vol. W, No. 42, p D2, November, 1975.

Descriptors: *Patents, *Filtration, *Waste water treatment, *Clarification, *Sewage treatment, *Filters, Sludge treatment, Separation techniques, Equipment.

A clarifier has been patented for the rapid filtration of polluted liquids, including industrial effluents, waste water, and sewage. Low density filtering materials are arranged in a clarifying vessel and press against a retaining grid when the vessel is full. The grid can be made of a finely perforated metal sheet, wire gauze or a plastic material. Filtered liquid can be stored for use in counter current washing. When the filter is clogged, the vessel is partially emptied through a valve until the filtering material is de-compacted and the sludge eliminated. Liquid to be treated is filtered in an upward direction. Filtration may be combined with pre-settlement; heavy particles which would normally interfere with filtration are separated out in a simple step. Back-washing of the filter is rapid and requires only a small amount of water. (Kramer-FIRL)
W76-06994

SEPARATION OF WATER FROM AQUEOUS MIXTURES.
Netherlands Patent NL 7503-699. Issued October 3, 1975. Derwent Netherlands Patents Abstracts, Vol. W, No. 42, p D3, November, 1975.

Descriptors: *Separation techniques, *Patents, *Liquid wastes, *Effluents, Membrane processes, Temperature, *Waste water treatment, Polymers.

A process has been patented for the separation of water from aqueous mixtures by diffusion through membranes into liquids with temperature dependent miscibility. The mixture is brought into contact with one surface of an organic polymer membrane which is selectively permeable with respect to water. Part of the water will permeate into and through the membrane while the other surface of the membrane is contacted with a water-miscible 'sweep-liquid' whose miscibility with water depends upon the temperature range of the membrane. The water-enriched miscible phase is removed from the second surface of the membrane and the temperature of the 'sweep-liquid' is altered to a temperature outside the miscibility range. Thus liquid phases are formed which may be separated. The process has low energy requirements and low costs. (Kramer-FIRL)
W76-06995

BIOLOGICAL AEROBIC PURIFICATION OF EFFLUENT.
South African Patent ZA 7405-313. Issued July 29, 1975. Derwent French Patents Abstracts, Vol. W, No. 42, p D2, November, 1975.

Descriptors: *Patents, *Biological treatment, *Activated sludge, *Aeration, *Waste water treatment, Oxygen, Equipment, Effluents, Clarification.

A method of activated sludge treatment has been patented which uses an interchangeable aerator and clarifier. In this process, two adjacent basins are used for effluent treatment. The wastes to be purified are supplied to one basin which acts as the activated sludge basin; oxygen or an oxygen mixture is supplied to this basin. After a predetermined residence time, the effluents are passed to the second basin which acts as the final purification basin. Purified water is removed from the second basin until the activated sludge concentration in the first basin drops below a given value. The direction of operation is then changed, so that the second basin functions as the activated sludge basin and the first basin as the final clarifier. (Kramer-FIRL)
W76-06996

DENITRIFICATION METHOD BY BIOLOGICAL METHOD: RELATIONS BETWEEN DENITRIFICATION AND BOD5 (SEIBUTSUGAKU TEKI HOHO NI YORU DATSU-CHISSO-HO: DATSUCHITSU TO BOD5 NO KANKEI),
E. Mikami.
Kankyo Sozo, (Environmental Creation), Vol. 5, No. 7, p 41-45, July, 1975. 2 fig, 8 tab, 7 ref.

Descriptors: *Biochemical oxygen demand, *Nitrification, *Denitrification, Biological treatment, Microorganisms, Anaerobic treatment, Aerobic treatment, *Waste water treatment, Oxidation.
Identifiers: BOD5.

Biological treatment in the denitrification of waste water is discussed. The biological denitrification process involves two steps oxidation-nitrification and denitrification. Microorganisms used in the former step are aerobic microorganisms, while those in the latter are anaerobic. The function in the first step is to oxidize the BOD to ammonium ion, and then further to nitrogen dioxide or nitrate. The second process reduces the inorganic nitrogen compounds to nitrogen gas. With the use of individual oxidation and nitrification steps, it was found that 97% denitrification could be achieved for the waste water containing both high BOD and nitrogen compounds. (Katayama-FIRL)
W76-06997

BLOOMINGTON GOES SOLID-STATE,
Orr-Schelen-Mayeron and Associates, Minneapolis, Minn.
For primary bibliographic entry see Field 5F.
W76-06998

STUDY OF THE REMOVAL OF PHOSPHATE FROM WASTE WATER BY LIME (UNTERSUCHUNGEN ZUR ABWASSERENTPHOSPHATUNG DURCH EINSATZ VON KALK),
F. W. Klages, and B. Meyer.
Gas-und Wasserfach-Wasser/Abwasser, Vol. 116, No. 8, p 370-372, August, 1975. 1 fig, 1 tab, 2 ref.

Descriptors: *Nutrient removal, *Phosphates, *Waste water treatment, Treatment facilities, *Lime, Sludge treatment, Biological treatment, *Chemical precipitation, Municipal wastes.
Identifiers: Phosphate removal, Ferric oxide.

Experiments on the preliminary removal of phosphates from the waste water of a municipal treatment plant are described. Residual phosphorus levels of 0.7-0.8 mg/liter could be achieved by adding slaked lime to reach pH values between 9.6 and 10. The slaked lime dose ranged from 125 to 210 g/liter. As a result of the slaked lime treatment, the volume of the sewage sludge decreased. Dry matter contents ranged from 8 to 14%, and good settling and dehydration of the sludge was achieved without additional conditioning. It was also possible to reduce the residual phosphorus content in the waste water to 0.25 mg/liter by coprecipitation with slaked lime and ferric oxide. (Takacs-FIRL)
W76-06999

EXPERIMENTAL STUDIES ON THE SEWAGE TERTIARY TREATMENT BY ROTATING DISC METHOD (KAITEN ENBANHO NI YORU GESUI 3-JI SHORI NO JIKKENTEKI KENKYU),
M. Ishiguro, Y. Watanabe, and S. Masuda.
Preprint, Japan Society of Civil Engineers, Tokyo, p. 528-529, 1975. 5 fig, 5 ref.

Descriptors: *Tertiary treatment, *Sewage treatment, *Biological treatment, *Nitrification, *Oxidation, Anaerobic conditions, Aerobic conditions, Denitrification, Activated sludge, Biochemical oxygen demand, Organic compounds, Turbidity, Effluents.
Identifiers: *Rotating disc method.

The tertiary treatment of sewage was studied using a rotating disc method. The facility consisted of four baths in series; each of these was equipped with several rotating discs 50 cm in diameter. The first three baths were for aerobic nitrification oxidation treatment and the fourth bath was for anaerobic denitrification treatment. The last bath was equipped with an apparatus to supply methanol. The rotating discs were operated at 5 to 10 rpm and the input of sewage water into the system was at the rate of one to 4.6 liters/min. Activated sludge treated water was used; parameters were: BOD, 22 to 60; COD, 10 to 50; TOC, 20 to 35; DO, 0 to 1.4; suspended solids (SS), 20 to 290; NH4-N, 20 to 110; T-N, 30 to 110; P04, 0.8 to 10 mg/liter; pH, 6.8 to 7.5; turbidity, 18 to 250, and temperature, 15 to 30 C. The effluent from the third bath contained BOD, 5 to 10; COD, 5 to 10; SS 10; ABS 0.1 to 0.4; P04, 0.6 to 6 mg/liter; and pH 6.7 to 7.0. The removal efficiency of BOD achieved by the first three baths was 85% and more than 90% for the 20 and 10 g/sq md loads, respectively. (Katayama-FIRL)
W76-07000

WASTEWATER TREATMENT PROCESS SENDS NUTRIENTS BACK TO THE LAND.
Engineering News-Record, Vol. 195, No. 22, p 18, November 27, 1975.

Descriptors: *Waste water treatment, *Recycling, *Construction, *Tertiary treatment, Ammonia, Nitrogen, Absorption, Ion exchange, Irrigation, California.
Identifiers: *Clinoptilolite, *Ammonia removal and recovery process(ARRP).

A 4.8 mgd advanced waste water treatment plant is under construction near North Lake Tahoe, California, and will be the first to include the ammonia removal and recovery process (ARRP). The process begins with a series of selective ion exchange beds that follow activated carbon treatment and includes closed-air towers and ducts in its stripping and absorption modules. As influent passes over 4-ft deep beds of clinoptilolite, the ammonium ions (concentrated at about 15 to 20 ppm) will be adsorbed. The remaining effluent will then pass through an 18-inch diameter pipe for chlorination and disposal. While all the waste water passes over the clinoptilolite, only the spent regenerant, enriched to an ammonium concentration of 300 ppm, is pumped to the stripping towers. There, sodium hydroxide converts the ammonium ions to ammonia gas, which is ducted to a smaller absorption tower and dissolved and concentrated. The liquid is pumped to storage tanks when the ammonium sulfate concentration reaches 40%. The solution leaving the absorption tower contains about 9% available nitrogen, suitable for direct irrigation by farmers or for blending by commercial fertilizer manufacturers. (Kramer-FIRL)
W76-07001

CRITERIA FOR THE EVALUATION OF THE EFFICIENCY OF SECONDARY SETTLERS (KRITEIY OTSENKI RABOTY VTORICHNYKH OTSTOYHIKOV),
A. I. Zhukov, I. V. Skirkov, and A. A. Bondarev.
Vodosnabzhenie i Sanitaranaya Teknika, No. 7, p 4-5, 1975. 1 tab, 2 ref.

Descriptors: *Activated sludge, *Aeration, *Waste water treatment, Treatment facilities, Equipment, Tanks, Sedimentation.
Identifiers: *Settling tanks.

Experiments were conducted to determine criteria for the efficiency of secondary settling tanks. The sludge index and the activated sludge concentration in the aeration tank were identified as universal criteria of the efficiency of secondary settling tanks, regardless of the design and of the type of activated sludge. One may substantially increase the throughput capacity of a purification facility by increasing the activated sludge dose in the aeration basin to a limit at which the normal operation of the secondary settler still exists. (Takacs-FIRL)
W76-07002

THE USE OF ACTIVABLE TRACERS IN THE EVALUATION OF THE PERFORMANCE OF WASTEWATER TREATMENT PLANTS,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
For primary bibliographic entry see Field 5A.
W76-07003

THROUGHFLOW MEASUREMENTS IN WATER AND WASTE WATER TECHNOLOGY (DURCHFLUSSMESSUNG IN DER WASSER- UND ABWASSERTECHNIK).
For primary bibliographic entry see Field 5F.
W76-07004

STUDIES ON COLON BACTERIA GROUPS DETERMINATION IN SEWAGE WATER (GESUICHU NO DAICHOKIN GUN SHIKEN NO KENTO),
For primary bibliographic entry see Field 5A.
W76-07005

VIRUSES IN WATER: THE PROBLEM, SOME SOLUTIONS,
Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5A.
W76-07006

CALCULATE CHEMICAL ADDITIVE FEED RATES IN THREE STEPS,
Interpace Corp., Rochester, N.Y. Pulsafeeder Products.
For primary bibliographic entry see Field 5F.
W76-07008

POLLUTION CONTROL PLANT STATISTICS.
Water and Pollution Control, Vol. 113, No. 10, p 84-102, October, 1975. 12 tab.

Descriptors: *Waste water treatment, *Water pollution control, Facilities, Data collections, *Sewage treatment, Costs, Statistics, *Treatment facilities, *Canada.

As part of a special 'directory' issue, comprehensive statistics are provided on all the municipal pollution control plant facilities in Canada. Information was gathered from regulatory agencies and municipalities. The data are arranged by province and figures are provided on: actual population,

population served, a 'yes' or 'no' on having industrial waste strength bylaws, average daily flow, a combined or separate sanitary sewage system, degree of treatment, plant influent and effluent characteristics, type of treatment, and cost per million gallons of waste water processed. (Kramer-FIRL)
W76-07009

PHOSPHORUS MODEL OF MUSKEGON WASTEWATER SYSTEM,
Robert S. Kerr Environmental Research Lab., Ada, Okla. Water Quality Control Branch.
For primary bibliographic entry see Field 5B.
W76-07011

THE CONTROL OF WASTE WATER FLOW OF NEW TOWN INTO THE TREATMENT PLANT (DANCHI GESUISHORIJO NO RYUNYUSUI NO SEIGYO NI KANSURU KENKYU),
M. Hiraoka, T. Murakami, I. Yamamoto, Y. Horii, and K. Ishimaru.
Mizushori Gijutsu, (Water Purification and Liquid Wastes Treatment), Vol. 16, No. 9, p 851, 1975.

Descriptors: *Control systems, *Waste water treatment, *Domestic wastes, Treatment facilities, Chemical precipitation, Chemical oxygen demand, Suspended solids, Tanks, Model studies.
Identifiers: *Balancing tank, Waste water flow.

The control of domestic waste waterflow into a treatment plant by utilizing a balancing tank was studied. The amount of waste water discharged varied over time, causing an unstable waste water treatment operation. A balancing tank to regulate the input amount of waste water into the treatment plant gave more stable operation. The tank could be installed either to intercept all waste water flow before feeding into the treatment plant (thus passing a constant amount of waste water into the plant) or to intercept only excess waste water flow (and discharge this flow when the normal levels were lower). Using the second method, COD and SS concentrations at the final precipitation pool were measured and compared with those concentrations without the balancing tank installation. Without the balancing tank, the COD value varied from 100 to 1100 mg/liter and SS from 30 to 1370 mg/liter. With the balancing tank, the COD and SS values were relatively constant at 50 mg/liter and 10 mg/liter, respectively. (Katayama-FIRL)
W76-07012

CIRIA ASSESSES ITS MODEL WAY TO TREAT SEWAGE.
Surveyor, Vol. 146, No. 4353, p 16, November 14, 1975.

Descriptors: *Model studies, *Mathematical models, *Sewage treatment, *Treatment facilities, *Costs, Research, Computers, *Waste water treatment.
Identifiers: Cost-effectiveness models, Construction Industry Research and Information Association(CIRIA).

The progress of a project to create a mathematical model for optimizing cost-effectiveness of sewage treatment plants was discussed by the Construction Industry Research and Information Association (CIRIA) of Great Britain. The model was developed two years ago in order to aid the designer of a sewage treatment facility in choosing the combination of processes and the size of units which best suit the required degree of purification while keeping costs at a minimum. The present assessment will test the process modules, locate and correct errors in the original computer program, check the mathematical optimization procedures, and undertake sensitivity analyses. The original model used only conventional sewage treatment techniques, but the completed model will include new processes in its cost evaluation. Details of over 100 test runs of the model have been reported in a Report entitled, 'Cost-effective sewage treatment--an assessment of the prototype model.' In this report, the conclusions of designers and researchers are stated, and general benefits of the assessment period are summarized. (Kramer-FIRL)
W76-07014

INTERACTION OF ACTIVATED CARBON WITH DISSOLVED OXYGEN,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
R. Prober, J. J. Pyeha, and W. E. Kidon.
AIChE Journal, Vol. 21, No. 6, p 1200-1204, November, 1975. 7 fig, 2 tab, 11 ref.

Descriptors: *Activated carbon, *Model studies, *Dissolved oxygen, *Laboratory investigations, Waste water treatment, Manometers, Sorption, Oxygen.
Identifiers: Packed columns, Rate data.

Experiments using manometric and packed column techniques to determine the rate and extent of dissolved oxygen sorption by activated carbon were performed. Several types of activated carbons were tested--granular and powdered, virgin and reactivated. All the carbons sorbed 150 to 600 micromoles/g of dissolved oxygen after run times of up to 1700 hours, but still not at equilibrium. Rate data conformed to a sorption model limited by intraparticle diffusion. The sorption of dissolved oxygen increased acidic surface oxides by about 200 microeq/gram; oxidation reactions were postulated, accounting for 10 to 50% of the sorbed oxygen. The data provide a new base line for oxygen uptake in the presence of organic solutes, bacterial growth, or catalytic oxidation processes. (Kramer-FIRL)
W76-07015

FLUORIDATION ENGINEERING MANUAL,
Environmental Protection Agency, Washington, D. C. Div. of Water Supply.
For primary bibliographic entry see Field 5F.
W76-07031

LAND AND SEA SOLIDS MANAGEMENT ALTERNATIVES IN PHILADELPHIA,
Philadelphia Water Dept. Pa.
For primary bibliographic entry see Field 5E.
W76-07033

ECONOMIC SCRUBBERS FOR THE PROCESSING INDUSTRY,
Processing, Vol. 21, No. 11, p 12, November, 1975.

Descriptors: *Economics, *Odor, *Sewage treatment, *Oxidation, *Waste water treatment, Operating costs, Hydrogen sulfide, Treatment facilities, *Ozone.
Identifiers: Sodium hydroxide, Scrubbers.

Ozone has been used rather than NaOH as the oxidant to reduce H2S emission levels in exhaust gas emissions from sewage and other waste treatment facilities. When ozone and sodium hypochlorite were compared, the operational costs for ozone treatment were found to be lower. Tests have been carried out in Great Britain for the Northumbrian Water Authority using NaOH plus ozone as the scrubbing medium. An inlet flow with a level of 0.33 ppm H2S was used; after a single stage scrubbing the level was reduced to below 0.001 ppm. Unlike sodium hypochlorite, ozone is generated on-site and the reaction results in no unwanted byproducts. (Kramer-FIRL)
W76-07036

SLUDGE REMOVAL FROM DRYING BEDS,
Public Works, Vol. 106, No. 11, p 64, November, 1975.

Descriptors: *Sludge disposal, *Waste water treatment, *Municipal wastes, Construction, Equipment, *Sludge treatment, Cleaning, Recycling, Wisconsin.
Identifiers: Track-type loader, Sludge removal, *Sludge drying beds.

Sludge drying beds at a municipal waste water treatment plant in Hartord, Wisconsin, have been cleaned by a small track-type loader. Each bed has a 70,000 gallon capacity and is constructed with a 17-inch deep bed of graduated sand and gravel over a grid of 8-inch tile pipe. Dried sludge must be removed monthly. A heavy machine would break the tile drains; manual cleaning proved to be slow and costly. A one cubic yard, 65 hp track-type loader was found to be powerful enough to clean the beds efficiently but had a tolerable pressure on the tile of about 10.1 psi. The loader's bucket teeth were removed and the bucket edge was set so as to skim off the sludge. Dried sludge will be hauled to a pickup point where it may be distributed to local citizens for fertilizer. The loader then smooths out the sand surface to prepare the drying beds for the next sludge application. The entire operation for each 45 x 165 ft bed takes about four hours. (Kramer-FIRL)
W76-07037

NEW SEWAGE PLAN STUDIED ON WEST COAST,
Compost Science, Vol. 16, No. 5, p 9, Autumn, 1975.

Descriptors: *Sewage treatment, *Treatment facilities, *Burning, Pilot plants, Capital costs, *Waste water treatment, Equipment, Recycling, California.
Identifiers: Pyrolysis.

A new sewage treatment system is being developed in which a pyrolysis furnace burns or bakes material without the oxygen necessary in conventional combustion, at temperatures of up to 1500F, thus reducing the fuel to elemental carbon. This furnace may be used to process sewage sludge. Solids are extracted from the sewage and burned to produce the activated carbon which is then used to filter the remaining sewage effluents. The resulting effluent is of a quality at least as clean as the product of conventional two-stage sewage treatment. The only residue of this system is a small amount of inert ash, and no sludge is produced. The process was developed by space-flight engineers at the Jet Propulsion Laboratory in Pasadena, California. A two-million dollar pilot plant will be constructed south of Los Angeles with a capacity of one mgd. The plant will be financed by the EPA and by state and municipal funds. Capital costs should be about 25% below that of a conventional secondary treatment facility. (Kramer-FIRL)
W76-07038

POST-TENSIONING SYSTEM REPAIRS OLD DIGESTERS,
Brown and Caldwell, Walnut Creek, Calif.
Z. Beyaz.
Public Works, Vol. 106, No. 11, p 70-71, November, 1975.

Descriptors: Construction, *Sludge treatment, *Waste water treatment, *Treatment facilities, Repairing, Equipment, Costs, Concrete, Coliform.
Identifiers: Tensioning, *Digesters.

A new tensioning technique has been employed to rehabilitate a Stockton, California, treatment facility for about one third the cost of building a new facilitiey. Three primary sludge digester tanks of an old design have been modified. All existing rods and defective gunite to two feet below ground level were stripped and the walls were sandblasted. Then one to 1 1/4 inches of gunite was applied as a leveling coat to permit continuous contact of the new tensioning rods. The rods were

than paced and stressed. The new stressing method used 160,000 psi alloy steel bands which are assembled on the ground and pulled up as hoops or placed on hanger bars. Once in place, the ends of the bars are pulled together with a hydraulic scissors-jack. After the exact load is achieved, the bar ends are fastened with couplers and tension is checked. The method works well around pipes connected to the tank or through the tank wall. Labor costs are about 30% of the total tensioning costs. (Kramer-FIRL)
W76-07039

UNDERWATER SEDIMENT REMOVED WITH MINIMUM TURBIDITY.
Water and Pollution Control, Vol. 113, No. 11, p 9, November, 1975.

Descriptors: *Turbidity, *Waste water treatment, *Oil wastes, *Sediments, Cleaning, Reservoirs, *Settling basins, Sludge disposal, Industrial wastes, Mud, Equipment.
Identifiers: Mud-Cat.

A machine has been developed to clean sediment from the bottoms of municipal reservoirs and industrial settling ponds. The Mud-Cat, operated by Boice Construction of Edmonton, Canada, is a self-propelled barge fitted with an eight-foot wide horizontal auger mounted on a hydraulically operated boom. The Mud-Cat pulls itself forward along a guide cable along the water and scoops up weeds, mud, silt, sand, sludge, and industrial wastes. Turbidity is eliminated by a special mud shield located above the auger. The machine can remove from 50 to 120 cu yd of material per hour. The auger and cutter are hydraulically raised and lowered, enabling the machine to follow the natural contours of a pond bottom without damaging a natural or artificial seal. The Mud-Cat has been used by the oil industry, for an irrigation reservoir, for removing paper fiber wastes, and for cleaning flood silt, sludge, and coal slurries in the United States and Canada. (Kramer-FIRL)
W76-07040

AWT PLANT CUTS NUTRIENTS ECONOMICALLY,
Ayres, Lewis, Norris, and May, Incorporated, Ann Arbor, Michigan, Systems and Studies Department.
A. K. Singhal.
Water and Wastes Engineering, Vol. 12, No. 11, p 89-92, November, 1975. 2 fig, 4 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Tertiary treatment, *Biological treatment, *Aeration, *Polymers, Flocculation, Costs, Filters, Nutrient removal, Michigan, Nitrification.
Identifiers: Rotating biological discs, Sand filters, Ammonia nitrogen removal, Phosphorus removal.

Expansion of a Cadillac, Michigan, waste water treatment plant to include tertiary treatment facilities has been accomplished without disturbing the operation of the existing plant. The new advanced waste water treatment plant consists of a biological system attached to rotating discs, combined with shallow bed rapid sand filters. This achieves a very high quality of effluent, particularly in terms of phosphorus removal and nitrification. The use of rotating discs for ammonia nitrogen removal was compared with extended aeration; the rotating disc system was both cost effective and easier to operate and maintain. Tests have been conducted on process requirements. A full scale plant study using ferric chloride and polymer was also conducted. By moving the point of addition of ferric chloride towards the tail end of the aeration tanks and by attaining optimum shear velocity by adjusting the quantity of air, phosphorus removal efficiency has been improved from 60% to 85%. A rational approach for the design of a flocculation system for phosphorus removal in an aeration system was also detailed. (Kramer-FIRL)
W76-07042

THE PHYSICAL METHOD OF WATER STERILIZATION,
For primary bibliographic entry see Field 5F.
W76-07043

BROOKHAVEN'S TWO SEWAGE TREATMENT PLANTS,
Brookhaven National Lab., Upton, N. Y.
M. M. Small.
Compost Science, Vol. 16, No. 5, p 7-9, August, 1975. 1 fig.

Descriptors: *Sewage treatment, *Water quality control, *Aeration, *Recycling, *Water reuse, Potable water, Aquaculture, *Waste water treatment.
Identifiers: Meadow/Marsh/Pond system, Marsh/Pond system, Land disposal.

Two schemes are being operated which treat 10,000 gpd sewage water on Long Island and return potable water to the groundwater supply system. A land intensive system, the Meadow/Marsh/Pond (M/M/P) scheme offers crops for harvest and sale. The second scheme, the Marsh/Pond system, requires less land. The M/M/P system consists of the dumping of raw sewage and septic tank sludges into a box where they are screened to remove bulky objects, passing these through a degritter to remove sand and other nondegradable material, and communition to reduce degradables to fines. The mixture is then passed into aeration ponds, treated by aeration, and pumped to a distribution header feeding overflow boxes at the heads of two sloped meadows. One meadow is used at a time; the other is dried for harvesting. By gravity flow through the sloped meadow, the influents are passed to a marsh, then to a stabilization pond stocked with aquatic species. With normal domestic sewage and sludges, pond effluent will be of potable water quality. An average of 50% of the treated influents are reused. The entire process takes place on an underlying impervious membrane so that no contaminants may be lost to the ground. Effluents are monitored prior to discharge. The Marsh/Pond concept is similar, but has no cash crop for nutrient removal and operates continuously, thus eliminating the margin for drying out, dry harvest, or operational corrections. The M/M/P system is a combination sewage treatment plant, aquaculture site, and farm. Cost analyses have not yet been performed. (Kramer-FIRL)
W76-07044

PILOT-SCALE WASTEWATER TREATMENT STUDIES,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. H. Y. Tebbutt.
The Public Health Engineer, Vol. 17, p 129-135, September, 1975. 10 fig, 7 tab, 15 ref.

Descriptors: *Pilot plants, *Sewage treatment, *Performance, *Sedimentation, *Biological treatment, Sludge, *Waste water treatment, Treatment facilities.
Identifiers: Hydraulic loading.

A pilot scale sewage treatment plant was constructed at Birmingham University, Great Britain, in order to investigate the performance relationships for several unit processes in sewage treatment. Data on plant loading conditions, settling efficiency, performance of individual runs, and on the sludge characteristics were compiled and analysed. Results indicated that: the performance of a primary sedimentation tank is influenced by the hydraulic loading and also by the initial concentration of suspended solids. A modification of Fair's retarded biological oxidation formula, which involves expressing the degree of treatment as the product of mixed liquor volatile suspended solids and aeration time, provides an acceptable fit to semi-batch activated sludge data. It was also demonstrated that increased primary tank loading produces a decrease in the treatability of settled sewage with respect to biological oxidation. Additionally, the nature of the sludge produced from primary and secondary treatment will not be much affected by variations in the primary tank hydraulic loading. (Kramer-FIRL)
W76-07045

SEWERAGE AND SEWAGE DISPOSAL,
For primary bibliographic entry see Field 5E.
W76-07046

REVIEW OF EPA RESEARCH AND DEVELOPMENT LAGOON UPGRADING PROGRAM FOR FISCAL YEARS 1973, 1974, AND 1975,
National Environmental Research Center, Cincinnati, Ohio. Advanced Water Treatment Research Lab.
R. F. Lewis.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 3-14. 14 fig, 5 tab, 7 ref.

Descriptors: *Lagoons, *Aerated lagoons, *Oxidation lagoons, *Waste water treatment, *Reviews, Standards, Effluent, Suspended solids, Biochemical oxygen demand, Research and development, Waste water(Pollution), Algae, Sewage lagoons.
Identifiers: Tertiary lagoons, Facultative lagoons.

The Environmental Protection Agency Research and Development Program for upgrading the performance of lagoon waste water treatment systems is reviewed. Approximately 90% of all of the waste water lagoons in the United States are located in communities of 10,000 people or less. Therefore, very little monitoring or analysis of influents or effluents takes place. A comprehensive survey taken of lagoons all across the country evaluated biochemical oxygen demand and suspended solids for facultative lagoons, aerated lagoons, oxidation ditches, and tertiary lagoons. The EPA and its predecessor organizations have sponsored several meetings and research projects on the general topic of waste water lagoons and in a few cases on means of upgrading lagoons. A vigorous lagoon upgrading program has been spurred by the passage of new standards for effluent BOD and suspended solids. Research needs for lagoon upgrading, which have been identified by a variety of state, academic and private groups, are presented. Projects for fiscal year 1973 included the removal of algae from lagoon effluents and a revision of the manual on algae and water pollution. Projects for 1974 were on the performance of evaluating existing facultative lagoons and the Lagoon Workshop Symposium. Projects that were planned for fiscal year 1975 include a chlorine disinfection study, the nitrification of lagoon effluent with a rotating biological contactor, and combined nitrogen and phosphorus control in a lagoon. A summary of funding for lagoon upgrading projects is given. It is hoped that funds will soon be available to study well-designed aerated lagoons and aerated/facultative lagoon combinations. (See also W76-67047) (Pinto-FIRL)
W76-07048

POLISHING LAGOON EFFLUENTS WITH SUBMERGED ROCK FILTERS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
W. J. O'Brien.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 31-46. 6 fig, 12 tab, 21 ref.

Descriptors: *Lagoon, Effluents, Rocks, *Filters, Algae, Chemical analysis, Alkalinity, Chemical oxygen demand, Biochemical oxygen demand, Suspended solids, Nitrogen, Phosphorus, Ammonia, Slime, Chlorophyll, Aeration, *Waste water treatment, *Filtration.

Identifiers: *Submerged rock filters, Algae removal, Filter life, Total suspended solids, Volatile suspended solids.

Lagoons have been widely used in small communities and isolated industrial plants in the United States for many years. Removal of algae from the final effluent can be costly if done by standard techniques. Submerged rock filters, which have the potential for avoiding this cost, have been tested in laboratory scale and pilot scale units. Field scale trials are reported in this paper. Two filters were tested: large rock and small rock. Samples were obtained from the lagoon effluent, the influent to the experimental lagoon and the effluent leaving the large rock and small rock filters, and were analyzed for total solids, volatile suspended solids, chemical oxygen demand, biochemical oxygen demand, ammonia, nitrogen, phosphorus, chlorophyll and pH. In the first six months of operation, the field scale installation responded the same way as the pilot scale had, as the biological slime layer was becoming established on the rock surfaces. Once this was established, the capture of suspended solids increased. Aeration facilities must be provided for the effluent part of the year. If the total alkalinity is greater than 260 mg/liter of calcium carbonate, there will be no odor problem. Effective filter life should be greater than 20 to 30 years. Rock sizes between 2.54 cm and 12.70 cm will make satisfactory filters. Most rocks in a filter should be within a range of 5 cm. More investigation is needed to investigate the relationship between rock size and hydraulic loading. Tentative guidelines can be designed for submerged rock filters. (See also W76-07047) (Pinto-FIRL)
W76-07049

STABILIZATION POND UPGRADING WITH INTERMITTENT SAND FILTERS,
Utah State Univ., Logan. Coll. of Engineering.
E. J. Middlebrooks, and G. R. Marshall.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 47-69. 8 fig, 19 tab, 13 ref.

Descriptors: *Oxidation lagoons, *Stabilization, *Ponds, *Lagoons, Sands, *Filters, Chemical analysis, Biochemical oxygen demand, Ammonia, Nitrates, Nitrites, Suspended solids, Oxidation, Algae, Utah, Standards, *Waste water treatment, Water quality standards, *Filtration, Sewage lagoons.
Identifiers: *Intermittent sand filters, Hydraulic loading rates, Algae removal.

Intermittent sand filtration can be used in communities surrounded by large areas of open land. The performance of the filters on a laboratory and pilot field scale was evaluated. Nine laboratory scale filters and nine field filters were evaluated. Sands used had effective sizes of 0.17, 0.35, and 0.72 mm. Hydraulic loading rates of 100,000 gpad, 200,000 gpad, and 300,000 gpad were used. Suspended solids, pH, and temperature were measured once every day, and samples were analyzed once a week for biochemical oxygen demand, ammonia, nitrate, nitrite, orthophosphate, phosphorus, suspended solids and pH. Hydraulic loading rate had little to do with any of the parameters in the laboratory tests, but in the field tests increased hydraulic loading caused a decrease in the suspended solids removal. Smaller size sands oxidized nitrogen compounds better. In the laboratory, hydraulic loading rates had little effect on the ability of sand to oxidize nitrogen. Ammonia primarily provided the nitrogen which was oxidized. After equilibrium was established, the intermittent sand filters did not remove a significant quantity of dissolved phosphorus compounds. BOD removal increased as the effective sand size decreased, as did algal and suspended and volatile solids removals. Some algae cells passed through the entire sand column without being removed. All waste water treatment plants can be upgraded by intermittent sand filtration to meet Class 'C' standards in the state of Utah. The process can be constructed and operated at a cost ranging between 15 and 47 dollars per million gallons of filtrate. (See also W76-07047) (Pinto-FIRL)
W76-07050

INTERMITTENT SAND FILTRATION TO UPGRADE LAGOON EFFLUENTS--PRELIMINARY REPORT,
Utah Water Research Lab., Logan.
J. H. Reynolds, S. E. Harris, D. Hill, D. S. Filip, and E. J. Middlebrooks.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 71-88. 15 fig, 6 tab, 9 ref.

Descriptors: Sands, *Filtration, *Lagoons, Effluents, *Filters, *Algae, Waste water treatment, Design criteria, Water quality standards, Standards, Chemical analysis, Suspended solids, Biochemical 0xygen demand, Chemical oxygen demand, Nitrites, Sewage lagoons.
Identifiers: *Intermittent sand filters, Hydraulic loading rates, *Sand filtration.

Intermittent sand filtration can be used in communities surrounded by large areas of open land. The performance of the filters in full-scale tests were evaluated and compared to results obtained using laboratory and pilot scale field intermittent sand filters. The ultimate objective was to develop design criteria that will consistently produce an effluent that would meet stringent water quality standards. Sand with an effective size of 0.17 mm was tested in six filters. Hydraulic loading rates of 0.2, 0.4, 0.6, 0.8, 1.0, and 1.2 mgad were used. Samples were collected and analyzed for suspended solids, biochemical oxygen demand, chemical oxygen demand, total phosphorus, orthophosphorus ammonia, nitrite, pH, temperature and dissolved oxygen. Different types of algae were used in this experiment from laboratory and pilot scale tests, but this had little effect on the filter performance. Results show that the length of the filter runs depended on the algal concentration and the hydraulic loading rates. The filter run was shorter in this test than in the laboratory and pilot scale tests. It varied from 14 days with a hydraulic loading rate of 1.2 mgad to 42 days with a hydraulic loading rate of 0.4 mgad. Twice as much of the total suspended solid matter was removed by filters with a hydraulic loading rate of 0.6 mgad than with a loading rate of 1.2 mgad. Suspended solids were reduced to less than 7.2 mg/liter from an average of 26.1 mg/liter and volatile suspended solids were reduced to less than 1.5 mg/liter from an average of 16.9 mg/liter for all filters. These full scale tests essentially confirmed the previous laboratory and pilot scale studies. (See also W76-07047) (Pinto-FIRL)
W76-07051

PERFORMANCE OF RAW WASTE STABILIZATION LAGOONS IN MICHIGAN WITH LONG PERIOD STORAGE BEFORE DISCHARGE,
Environmental Protection Agency, Washington, D.C.
D. M. Pierce.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 89-135. 4 fig, 15 tab.

Descriptors: *Stabilization, *Lagoons, *Storage, *Waste storage, Municipal wastes, *Waste water treatment, Illinois, Michigan, North Dakota, Minnesota, Coliforms, Bacteria, Suspended solids, Treatment, Discharge(Water), Chlorination, Aerated lagoons, Water quality standards, *Sewage treatment, Sewage lagoons.
Identifiers: Raw waste stabilization lagoons, Long period storage, Control short period discharge.

Conditions under which secondary treatment requirements could be met by raw waste stabilization lagoons are determined. Forty nine municipal lagoon systems typifying features of construction, loadings, and maintenance and operational practices which readily accomodate a common mode involving long period storage followed by control short period discharge were chosen in Michigan. Records from the forty nine plants were reviewed and recorded for analyses of BOD and suspended solids. These data were analyzed statistically in terms of probability of occurrence. In-depth studies were made of fecal coliform data to determine seasonal trends in their levels. No relationship was found between fecal coliform levels and BOD and suspended solids levels. Results showed that the lagoons studied can consistently produce effluents meeting EPA requirements for BOD and fecal coliforms and can generally meet standards for suspended solids. Supplementary studies were undertaken: to evaluate performance of raw waste stabilization lagoons in other northern states when managed in similar ways; to examine the methods in use and results of chlorination for coliform bacteria destruction both at lagoons so managed and those with continuous discharge; and to collect available data on nitrification phenomena. Other raw waste stabilization lagoons with long period storage and intermittent discharge were studied in Minnesota; North Dakota; Upper Penninsular, Michigan; and Belding, Michigan. Chlorination at continuous discharge stabilization lagoons was studied in Chesterfield Township, Michigan and Illinois. Chlorination of lagoon contents, lagoons following secondary treatment and aerated lagoons were also studied. (See also W76-07047) (Pinto-FIRL)
W76-07052

STATE OF THE ART OF LAGOON WASTEWATER TREATMENT,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
R. E. McKinney.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 150-20.

Descriptors: *Oxidation lagoons, *Lagoons, *Waste water treatment, *Reviews, Microbiology, Biological treatment, Effluents, Rainfall, Evaporation, Design criteria, Design, Temperature, Ponds, Sewage lagoons.
Identifiers: Multiple oxidation ponds.

Current knowledge on the advantages and disadvantages of oxidation ponds is discussed. Used extensively in small communities and isolated industries in the United States, oxidation ponds have the advantage of simplicity of construction, design and operation, along with the product of a highly stabilized effluent. It was found that oxidation ponds worked differently in different parts of the country. Little operational data had been gathered. There existed the need to know exactly how oxidation ponds worked and to examine the alternatives if it were found necessary to replace them. Studies showed that the size of oxidation ponds depends on the size of the population being served, the rate of rainfall compared to the rate of evaporation, and the length of the winters. Research performed on the biological reactions showed them to be much more complex than those that were previously thought to control the process. An understanding of the microbiology was not considered essential when designing oxidation ponds, but it could help. Temperature and temperature changes were found to be important in effecting metabolism rates. After a total evaluation of all the factors involved, it appears that oxidation ponds have their place in waste water treatment. With proper design using multiple ponds and adequate holding time and properly designed transfer and effluent pipe structure, oxidation ponds can produce a satisfactory effluent when considerations are made for evaporation. (See also W76-07047) (Pinto-FIRL)

W76-07053

UPGRADING LAGOON TREATMENT WITH LAND APPLICATION,
Robert S. Kerr Environmental Research Lab., Ada, Okla. Water Quality Control Branch.
R. E. Thomas.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 183-186. 9 refs.

Descriptors: *Lagoons, *Treatment facilities, *Waste water treatment, Overland flow, Infiltration, Crops, Percolation, Irrigation, Design, Effluents, *Sewage treatment, Sewage lagoons.
Identifiers: Secondary effluents, Land application.

Land application to upgrade lagoon treatment of waste waters is a promising approach. Some techniques that are not in common use at the present time include: crop irrigation; infiltration-percolation; and overland flow. The uses of these techniques are described with relation to developing technology and approaches that have been used for many decades. Crop irrigation is an alternative which has been used for many decades with a high degree of success under a variety of climatic conditions. Existing systems can provide much information on design and operating experiences which have led to problems as well as successes. Infiltration-percolation is another alternative which has limited but widespread use for advanced waste treatment of secondary effluent. This process usually follows activated sludge or trickling filters as the secondary treatment process. The information on design and operating experience following lagoon treatment is not extensive. Information on infiltration-percolation following other conventional processes for achieving secondary treatment can be used by those contemplating infiltration-percolation for upgrading lagoon treatment. Overland flow is being evaluated for upgrading secondary effluents and for complete replacement of conventional secondary treatment processes. (See also W76-07047) (Pinto-FIRL)
W76-07054

EVALUATION OF WASTEWATER TREATMENT PLANTS AT HENDERSON, NEVADA,
Environmental Protection Agency, San Francisco, Calif.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-240 253, $3.50 in paper copy, $2.25 in microfiche. May, 1973. 16 p, 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Treatment facilities, Nevada, Monitoring, Municipal wastes, Operation, Maintenance, Effluents, Filtration, Biological treatment, Salinity, Oxidation lagoons, Trickling filters.
Identifiers: Imhoff tanks.

A descriptive evaluation is presented of the two waste water treatment facilities owned by the City of Henderson, Nevada. The operation and maintenance of each plant was surveyed and waste water samples were collected in an effort to locate point sources of high salinity effluents. It was found that the Henderson Wastewater Treatment Plant No. 1, built in 1957, is operated and maintained in an acceptable condition. The plant uses two Imhoff tanks and two oxidation ponds in series and operates within the expected range of removal rates. However, the Henderson Wastewater Treatment Plant No. 2, built in 1943, was found to have deteriorated to an unacceptable condition. The two-stage trickling filter plant was designed for both industrial and municipal wastes. While the city is attempting to restore the plant to operable conditions, the many yeas of operation without proper maintenance have caused most of the units, piping, and pumps to need major repairs. Such repairs will be costly in both materials and manpower. (Kramer-FIRL)
W76-07055

MODIFICATIONS IMPROVE CHLORINE CONTACT CHAMBER PERFORMANCE, PART II,
Worcester Polytechnic Inst., Mass. Dept. of Civil Engineering.
F. L. Hart, R. Allen, J. DiAlesio, and J. Dzialo.
Water and Sewage Works, Vol. 122, No. 10, p 88-90, October, 1975. 6 fig, 3 tab, 15 ref.

Descriptors: *Chlorine, Hydraulics, Waste treatment, *Waste water treatment, Graphical analysis, Flow, Flow characteristics, Model studies, Tracers, *Performance, *Treatment facilities.
Identifiers: *Chlorine contact chambers, Plug flow system.

Part two of a study on modifications to improve chlorine contact chamber performance, presenting the second and third stages, is discussed. After establishing a hydraulic similarity between the field tank and the laboratory scale model tank in the first stage, a detailed study of the model tank flow patterns is conducted in stage two to provide data that will lead to model tank modifications. Results at three water levels are graphically presented. Undesirable hydraulic patterns were experienced and corrective measures were taken. Results for this modified chamber were also illustrated. In stage three, rhodomine WT dye tracer evaluations were conducted to determine the degree of hydraulic improvement to the chlorine contact system. Output response function values for the modified model chamber and a percent difference comparison with the unmodified model chamber were tabulated. The three sampling points are uniform for the modified chamber as compared to the unmodified chamber. The hydraulic pattern was shown to generally improve. A reduction of mixing patterns was indicated. Output response function data were graphically illustrated. The modified chamber approximates the ideal plug flow system closer than the unmodified chamber. (See also W76-03231) (Pinto-FIRL)
W76-07056

MODEL PLANT FOR BIOLOGICAL REMOVAL OF PHOSPHATE FROM COMMUNAL WASTE WATER, III. BIOLOGICAL PHOSPHATE REMOVAL FROM COMMUNAL WASTE WATER PRELIMINARILY CLEANED BY A BIOLOGICAL PROCESS (MODELLVERFAHREN ZUR BIOLOGISCHEN ENTPHOSPHATUNG KOMMUNALER ABWAESSER, III. BIOLOGISCHE ENTPHOSPHATUNG BIOLOGISCH VORGEREINIGTEN KOMMUNALEN ABWASSERS ENIES KALERWERKES),
G. Bringmann, and R. Kuehn.
Gesundheits-Ingenieur, Vol. 96, No. 10, p 249-251, October, 1975. 1 fig, 6 tab.

Descriptors: *Biological treatment, *Phosphate, *Nutrient removal, *Waste water treatment, Carbon dioxide, Filters, Municipal wastes, Microorganisms, Model studies, Pilot plants.
Identifiers: Phosphate removal, Ferrous chloride.

A model plant for the biological removal of phosphate from biologically pretreated municipal waste water has been developed. The purified waste water, with a neutral pH value stabilized by means of carbon dioxide, passes through four aerated biological filters. Ferrous chloride is added at a P:Fe ratio of 1:1.36 relative to the ferrous chloride demand of the complex plant. At an initial phosphate ion concentration of 10.42 mg/liter, the phosphate removal efficiency amounted to 99.93%, corresponding to a residual phosphate concentration of 0.007 mg/liter. The phosphate removal is performed by microorganisms which oxidize ferrous ions to ferric ions. Ammonium nitrogen does not interfere with the process. (See also W75-01765) (Takacs-FIRL)
W76-07057

ONSHORE TREATMENT SYSTEM FOR SEWAGE FROM WATERCRAFT RETENTION SYSTEMS,
General American Transportation Corp., Niles, Ill. General American Research Div.
A. J. Glueckert, and P. A. Saigh.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-239 630, $4.00 in ppaper copy, $2.25 in microfiche. Report EPA-670/2-75-007, March, 1975. 38 p, 8 fig, 9 tab, 24 ref.

Descriptors: *Waste water treatment, *Incineration, *Evaporation, *Sewage treatment, Costs, Energy, Domestic wastes.
Identifiers: Evaporative waste system, Watercraft sewage.

Sanitary wastes collected from watercraft at marina pumpout stations often contain high concentrations of chemical additives and are generally more concentrated than typical wastes entering municipal sewer systems. In order to treat these wastes, the General American Research Division of the General American Transportation Corporation has developed an Evaporative Toilet System (ETS) for the collection and treatment of such raw sewage. An evaporative waste system was tested by operating a propane-fired evaporator for 224 hours with in-house sewer wastes and wastes collected from marina holding tanks. The system treated 1,212 gal of sewage and concentrated the total solids of sludge from 0.5% to 12.4%. Concentrated sludge was then incinerated in a batch-type incinerator. It was demonstrated that this method is applicable as an alternative to hauling watercraft wastes to sewers or other disposal sites. The chemical additives had no deleterious effects on the evaporator. The evaporator required about one million kilocalories per 1000 liters of waste water evaporated; costs depended upon the price of the fuel used. (Kramer-FIRL)
W76-07058

FERRIC CHLORIDE AND ORGANIC POLYELECTROLYTES FOR THE REMOVAL OF PHOSPHORUS,
Grand Rapids Wastewater Treatment Plant, Mich.
O. Green, D. VanDam, B. LaBeau, T. Campbell, and S. L. Daniels.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-239 866, $5.50 in paper copy, $2.25 in microfiche. Report EPA-670/2-73-103, February, 1974. 12 fig, 21 tab, 40 ref, 3 append.

Descriptors: *Polyelectrolytes, *Nutrient removal, *Phosphorus, *Waste water treatment, *Activated sludge, *Chemical precipitation, Flocculation, Treatment facilities, Polymers, Economics, Biochemical oxygen demand, Suspended solids, Heavy metals.
Identifiers: Ferric chloride, Organic polyelectrolytes.

A total phosphorus content of 1.0 mg/liter or less was obtained in the final effluent of a 44 mgd activated sludge plant at Grand Rapids, Michigan. This municipal waste water treatment facility consisted of chemical precipitation and flocculation systems of ferric chloride and an organic polymeric flocculant. Split addition of chemicals was practiced, with ferric chloride added to both the primary and secondary systems and flocculant added only to the secondary system. The performance and economic improvements obtained in other unit processes were also demonstrated. During normal flow these included: reduced organic loading to the activated sludge process, reduced BOD and suspended solids in the final effluent, additional heavy metals removal, and improved solids handling and disposal up to the limits of capacity. (Kramer-FIRL)
W76-07059

THE INVESTIGATION OF ION REMOVAL FROM WATER AND WASTEWATER,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
R. J. Starkey, Jr., M. E. Kub, A. E. Binks, and K. K. Jain.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-240 158, $6.00 in paper copy, $2.25 in microfiche. Report EPA-660/3-74-022, August, 1973. 38 fig, 19 tab, 14 ref, 6 append.

Descriptors: *Waste water treatment, Coagulation, Phosphorus, *Nutrient removal, *Cations, *Anions, Polyelectrolytes, *Water treatment, Adsorption, Dialysis, Organic compounds, Ions.
Identifiers: *Ion removal.

Capillary membrane dialysis, alumina adsorption, and alum/polyelectrolyte coagulation techniques were evaluated under laboratory conditions to determine their relative effectiveness in removing nutrients, cations, and anions from freshly collected samples of stream water and waste water effluents. Of these, alumina adsorption was highly effective in the removal of phosphorus, inorganic carbon, and most cations, and reduced specific conductance and hardness. High Kjeldahl and ammonia nitrogen removal efficiencies of alumina were observed only in samples of waste water where pre-treatment concentrations were relatively high. With alumina treatment, however, dissolved solids contents and pH increased. Dialysis was less effective than alumina adsorption regarding cation removal, but produced equivalent results with respect to inorganic carbon. Organic carbon concentrations were not significantly reduced, due to the association with macromolecules having a molecular weight greater than 5000. Dialysis was superior in the removal of sodium, potassium, chloride, nitrate-nitrite, boron, and dissolved solids. Coagulation was effective in removing phosphorus from all waters but was highly ineffective in respect to all the other parameters. (Kramer-FIRL)
W76-07060

REVERSE OSMOSIS OF TREATED AND UNTREATED SECONDARY SEWAGE EFFLUENT; APPENDIX A-2 AND APPENDIX A-6,
Eastern Municipal Water District, Hemet, Calif.
D. F. Boen, and G. L. Johannsen.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-239 354, $4.00 in paper copy, $2.25 in microfiche. Report EPA-670/2-75-027, January, 1975. 42 p, 2 append.

Descriptors: *Reverse osmosis, *Pilot plants, *Data collections, *Statistical analysis, *Sewage effluents, Sewage treatment, *Waste water treatment.
Identifiers: Appendices.

This volume was published to complete the report, 'Reverse Osmosis of Treated and Untreated Secondary Sewage Effluent', EPA-670/2-74-077. Appendix A-2 consists of pH's R.O. Units Feed, and lists data by project week and day. Appendix A-6 is a computer printout summary for monthly statistics from reverse osmosis tests. These data correspond to six commercially designed reverse osmosis pilot units from Universal, Raypak, Gulf, Du Pont, American Standard, and Aerojet. (See also W76-03351) (Kramer-FIRL)
W76-07061

THE INFLUENCE OF IRRIGATION BY MEANS OF DAIRY PLANT SEWAGE POURED OUT OF SPRINKLING PIPES ON THE YIELDS OF SOME PLANTS CULTIVATED ON SANDY SOIL AT LASKOWICE OLAWSKIE, (IN POLISH),
Instytyt Uprawy Nowozenia i Gleboznawstwa, Pulawy (Poland).
S. Zabek.
Pamiet Pulawski 60, p 19-32. 1974.

Descriptors: Irrigation, *Sewage, *Waste water disposal, Water reuse, Crop production, Nitrogen, Phosphorus, Toxicity, *Farm wastes.

The influence of irrigation by means of dairy plant sewage poured out of sprinkling pipes on plants (buckwheat, field bean, kale, potatoes and forage carrot) was studied at Laskowice Olawskie, Poland, from 1965-1966. Sewage was applied at 855, 1490 and 1680 m3/ha. In the group of treatments with sewage, a mean yield increase of 20% was obtained and in the group of sewage plus NPK the increase was 45% in relation to the yield with NPK fertilizing alone. These increases were 2-5 times lower than in analogous groups of treatments on the same soil under the sprinkling conditions of artificial rain or slope - flood irrigation. Kale and forage carrot in their early development stage cannot withstand the dairy sewage flood.--Copyright 1975, Biological Abstracts, Inc.
W76-07110

COST AND PRICING RELATIONSHIPS IN WATER SUPPLY,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
For primary bibliographic entry see Field 3D.
W76-07145

STATISTICAL STUDY OF PHOSPHORUS REMOVAL IN WISCONSIN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5A.
W76-07146

OPTIMIZATION OF EVAPORATION POND COST,
Bechtel Inc., Gaithersburg, Md.
S. C. Mehrotra.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE1, p 165-173, February 1976. 2 fig, 1 tab, 3 ref.

Descriptors: *Environmental engineering, *Evaporation, *Reservoirs, *Costs, Dissolved solids, Ponds, *Optimization, Water pollution control, Systems analysis, Equations, Mathematical models, Equilibrium, Behavior, Powerplants.
Identifiers: Cost minimization, Blowdown.

Transient and equilibrium behavior of a prismatic evaporation pond is studied for a given relationship between the evaporation rate and the concentration of the dissolved solids in the blowdown. It is demonstrated that equilibrium is established in relatively short time. By studying the equilibrium pond behavior, a cost function is developed, and the optimum equilibrium concentration for its minimization is found. The optimum area and volume of the pond can be calculated once the optimum equilibrium concentration has been found. An outline of the mathematical formulation for the general optimization problem involving a series of ponds is also presented.
W76-07147

MANAGING LIVESTOCK WASTES.
American Society of Agricultural Engineers, St. Joseph, Mich.
ASAE Publication PROC-275, Proceedings 3rd International Symposium on Livestock Wastes - 1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, 631 p.

Descriptors: *Farm wastes, *Waste treatment, *Waste disposal, *Waste storage, Energy, *Livestock, *Legal aspects, Nutrients, Biological properties, Chemical properties, Gases, Odors, Design, Agricultural runoff, Dehydration, Performance, Feedlots, Confinement pens.
Identifiers: *Refeeding, *Land disposal, Oxidation ditches, Barriered landscape and reverse osmosis.

One hundred and eighty papers describing major research studies, state-of-the-art and literature reviews, and case studies of livestock farms with complete waste management systems were presented. Topics discussed were: (1) Health impacts, (2) Economic impacts, (3) Impacts of regulations, (4) Legal constraints, (5) Systems for poultry, (6) Systems for beef, (7) Systems for dairy, (8) Systems for swine, (9) Utilization of waste as livestock feed, (10) Utilization for energy, (11) Nutrient utilization on land, (12) Nutrient transport in soil, (13) Nutrients in manure, (14) Microbiology of wastes, (15) Waste properties, (16) Gases and odors, (17) Systems design factors, (18) Feedlot runoff control, (19) Handling, (20) Liquid solid separation, (21) Dehydration, (22) Composting, (23) Oxidation ditches, (24) Anaerobic treatment, (25) Surface aerators, (26) Barriered landscape and reverse osmosis, and (27) High rate land spreading thirty technical papers were presented by scientists from outside the U.S.A. (See W76-07155 thru W76-07203) (Merryman-East Central)
W76-07154

SURVIVAL OF SALMONELLAE, TOTAL COLIFORMS AND FECAL COLIFORMS IN SWINE WASTE LAGOON EFFLUENTS,
Clemson Univ., S.C. Dept. of Microbiology.
D. J. Krieger, J. H. Bond, and C. L. Barth.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes - 1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 11-14.

Descriptors: *Farm wastes, *Salmonellae, Lagoons, *Farm lagoons, Waste water treatment, *Coliforms, *Hogs.

Survival characteristics were determined of Salmonella cholerae-suis, Salmonella typhimurium, total coliforms and fecal coliforms in swine waste lagoon materials. Columns of swine waste lagoon material were loaded with various population densities of S. cholerae-suis and S. typhimurium. Enumeration of total and fecal coliforms employed MPN methods utilizing lactose broth and E C. medium, respectively. Salmonella were determined by MPN methods using Tetrathionate Broth, and confirmed by plating on Brilliant Green agar and agglutination with Salmonella 0 antiserum poly A-1. Initial population counts of 2.5 x 10,000 organisms/ml of S. cholerae-suis and 7 x 100,000 organisms/ml of S. typhimurium decreased to non-recoverable levels in 24 days. Initial natural populations of 20 organisms/ml of fecal coliforms showed complete die-off after 10 days, and natural populations of 3.3 x 10,000 organisms/ml of total coliforms died off in 21 days. Survival times were also determined in columns which were loaded with high and low initial Salmonella populations. In all cases, the survival time of the organisms observed was determined by the initial numbers, whereas, the death rate of Salmonella was independent of the numbers in the original population. Antagonisms were not responsible for die-off rates. Depletion of an essential growth factor was probably the cause of death. (See also W76-07154) (East Central)
W76-07155

PATHOGENIC MICROORGANISMS IN THE ENVIRONMENT,
Agricultural Research Service, Beltsville, Md.; and Animal and Plant Health Inspection Service, Beltsville, Md.
For primary bibliographic entry see Field 5C.
W76-07156

ECONOMIC RESEARCH PERTAINING TO PROBLEMS OF LIVESTOCK WASTE MANAGEMENT AND POLLUTION CONTROL,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-07157

ECONOMIC IMPACTS OF ALTERNATIVE WATER POLLUTION CONTROL RULES ON BEEF FEEDLOTS OF LESS THAN 1000 HEAD CAPACITY,
Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
D. L. Forster, L. J. Connor, and J. B. Johnson.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign April 21-24, 1975, p. 41-44.

Descriptors: *Legislation, *Water pollution control, *Feed lots, *Cattle, *Economic impact, *Agricultural runoff, *Farm wastes, Alternative water use.

Estimates are made of the economic impacts of four alternative water pollution rules on the behavior of beef feedlots over the 1975-1985 period. The four alternative water pollution control rules applied to beef feedlots of all capacity levels were: (1) current EPA guidelines requiring control of feedlot runoff from the local 10-year, 24-hour rainfall and process generated waste waters by 1977 and runoff from the local 25-year, 24-hour rainfall and process generated waste waters by 1983; (2) the construction of control facilities for control of the local 25-year, 24-hour storm and process generated waste waters by 1983; (3) the control of all runoff from rainfall occurring in any six-month interval by 1977; and (4) the control of all runoff from rainfall occurring in a six-month interval and no winter spreading of feedlot solid wastes. A simulation model was used to represent the production behavior of beef feedlots typical of the Lake States and Corn Belt over the 1975-1985 period. Imposition of rule 1 on feedlots of less than 1,000 head would result in an average feedlot firm equity loss of $3,720 over the 1975-1985 period. Rule 2 would result in average equity loss of $3,911 over the 1975-1985 period. Rule 3 would result in average equity loss of $4,800 per feedlot. Rule 4 would result in an average equity loss of nearly $6,000 per feedlot over the 1975-85 period. The decline in marketing would range from one-half to one percent under the four rules over the 1975-1985 period, resulting in only nominal price increases for fed beef. Economic effects at the feedlot level would not be uniform, placing the greatest burden on the smaller feedlots. (See also W76-07154) (East Central)
W76-07158

EFFECTS OF ENVIRONMENTAL LEGISLATION OF CATTLE FEEDLOT LOCATION,
Ohio State Univ., Columbia. Dept. of Industrial and Systems Engineering.
For primary bibliographic entry see Field 5G.
W76-07159

ECONOMIC IMPACTS OF IMPLEMENTING EPA WATER POLLUTION CONTROL RULES ON THE UNITED STATES BEEF FEEDING INDUSTRY,
Economic Research Service, East Lansing, Mich.
For primary bibliographic entry see Field 5G.
W76-07160

ECONOMIC AND ENVIRONMENTAL ASPECTS OF DAILY AND ANNUAL DAIRY MANURE SPREADING SYSTEMS IN A SMALL WATERSHED,
Pennsylvania State Univ., Reading. Extension Service.
W. H. Schaffer, G. L. Casler, and J. J. Jacobs.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p 53-56.

Descriptors: *Economics, *Dairy industry, *Watersheds(Basins), *New York, *Model studies, Nitrogen, Phosphorus, Small watersheds, *Farm wastes, Soils, Costs, Environment, Waste treatment.
Identifiers: *Land spreading, Soil loss.

Simulated nitrogen, phosphorus and soil loss are reported from a 7,000 acre watershed where daily manure spreading is practiced. Simulated results also are included when the system is changed to 12 months storage combined with direct incorporation of manure within 24 hours. The simulated nitrogen, phosphorus and soil losses from the two systems are incorporated into an analysis to determine the economic and environmental impact of controlling nutrients losses from the watershed under various policies. The physical model was constructed from published laboratory and field data and had sub-components for soil moisture, soil temperature, soil movement, nitrogen and phosphorus. The basic economic model was structured to be representative of the kinds, amounts and intensities of agriculture found by survey in a small central New York watershed. The modeling suggests that farm costs of reducing nutrient losses to water are substantial. In addition to the loss of nutrients to water, other environmental factors, such as odor, flies and appearance, should be considered when evaluating dairy manure handling systems. A summary of the cost and environmental impact, which is a combination of 7 environmental characteristics, of alternative dairy manure handling systems is included. Results indicate that manure handling systems need to be carefully evaluated for their economic and environmental impact. (See also W76-07154) (East Central)
W76-07161

IMPLICATIONS OF SELECTED NON-POINT SOURCE POLLUTION REGULATIONS FOR U.S. DAIRY FARMS,
Minnesota Univ., St. Paul.
For primary bibliographic entry see Field 5G.
W76-07162

FEEDLOT EFFLUENT LIMITATIONS BASED UPON EXEMPLARY OPERATIONS,
Environmental Protection Agency, Washington, D.C. Impact Analysis Agency.
For primary bibliographic entry see Field 5G.
W76-07163

PARTNERSHIP IN POLLUTION CONTROL,
Illinois Pollution Control Board, Chicago.
For primary bibliographic entry see Field 5G.
W76-07164

THE NPDES DISCHARGE PERMIT PROGRAM FOR AGRICULTURAL POINT SOURCES,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-07165

TECHNIQUES THAT ARE SOLVING POLLUTION PROBLEMS FOR POULTRYMEN,
New York State Coll. of Agriculture and Life Sciences, Ithaca.
C. E. Ostrander.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 71-73.

Descriptors: *Poultry, *Waste treatment, *Waste treatment, *Waste disposal, Odor, Water pollution, Aeration, Dehydration, Economics, *Farm wastes, Oxidation lagoons, Feed lots.
Identifiers: Soil injection, Refeeding.

Poultrymen, who have struggled in the past with the pollution problem, are now accepting research information and putting it into practice. Some techniques are not economically feasible but many are. Some of the more applicable and successful are described. (1) The 'High Rise' poultry house, when constructed and managed properly, has aided in preventing pollution and provides maximum flexibility. Site selection and preparation as well as proper drainage and management are key factors for success. (2) Soil injection is very successful where odors from spreading anaerobic material is the primary problem. This does not prevent 'house odors' or odor from storage. Closed storages are required because soil injection may have to be a seasonal operation. (3) Dehydration can prevent odors if fresh material is used with proper equipment and adequate afterburners. Adequate markets are necessary if this is to be economically feasible. If the dehydrated product is approved for use as an animal protein supplement this will aid large producers with little land. (4) The oxidation ditch, which has a higher investment cost, can aid producers located in populated areas. This can be operated practically odor free and the effluent and/or sludge can be spread almost anyplace, at any time, without offending anyone. Effluent cannot be admitted to waterways without further treatment. (5) Surface aeration, much like the oxidation ditch, reduces odors. Being outside, it does not function as efficiently during cold weather in northern climates. There may be some odors during the spring when microbial activity increases. It is subject to 'slug loading' which may produce some odor and foaming. Sufficient volume and aeration are essential and it is probably more applicable in warm climate areas. (See also W76-07154) (East Control)
W76-07166

CONTROL, COLLECTION, AND DISPOSAL OF FEEDLOT RUNOFF,
Nebraska Univ. Lincoln.
N. P. Swanson, L. N. Mielke, and C. L. Linderman.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 85-87.

Descriptors: *Regulation, Engineering, *Design, *Feed lots, Water pollution, Nebraska, *Farm wastes, Waste disposal, Waste treatment, Agricultural runoff.
Identifiers: *Runoff control.

As a result of pollution control regulations, many feedlots have instigated pollution control measures; but often they have done so utilizing fallacious concepts and without sufficient knowledge of engineering principles. The application of soil and water engineering principles has provided adaptation of practices and facilities to abate the water pollution hazard. Collection of hydrologic data from feedlots and interpretation of meteorological records have provided values for the parameters and variables involved in designs. Applications include diversions to eliminate surface runoff into feedlots, terraces to control overland flow within feedlots, basins and solids traps for the collection of runoff transported solids, riser inlets and underground conduit for conveyance of collected runoff, sumps and pumps to provide lift for feedlot drainage where gravity flow is not possible, holding ponds for storage of runoff effluent, pumping and distribution equipment for applying the effluent to the land, and management of effluent on crops and soils for nutrient utilization and control of pollution hazards. Full consideration of practices and techniques and avoidance of stereotyped concepts is necessary in engineering for pollution abatement of outdoor feedlots. Even then, failures can occur. The design of runoff controls on a feedlot must also provide for animal comfort, minimize management requirements, and keep investment and maintenance costs commensurate to potential income and benefits to the environment. (See also W76-07154) (East Central)
W76-07167

MANAGEMENT OF RUNOFF WATER IN RELATION TO FEEDLOT OPERATIONS,
Soil Conservation Service Temple, Tex.
H. N. McGill, and G. C. Vittetoe.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 88-92.

Descriptors: *Agricultural runoff, *Feed lots, Economics, Lagoons, Irrigation, *Farm wastes, Operation, Waste disposal, Waste treatment.
Identifiers: *Land disposal.

The most practical and economical system for cattle feedlot runoff control is one where (1) as much outside drainage as possible is diverted from the feedlot, and (2) the runoff water from the feedlot proper is intercepted and impounded in holding ponds, and later disposed of on agricultural crops. Disposal lagoons designed to treat solid and liquid wastes from feedlots have very limited application in cattle feedlot pollution abatement systems due to the size of the surface areas required for such lagoons. Therefore, systems of retention and irrigation which result in a 'no-effluent' condition are best suited for cattle feedlots. In planning and designing the retention-and-irrigation-type abatement systems, the size of irrigated area in relation to the area of the feedlot must be considered for the varied conditions that can be encountered. Cattle feedlot runoff management tools that can be used for a wide range of climatic and management conditions. These tools relate annual precipitation to feedlot storage requirements and irrigation area-feedlot area ratios needed to prevent spills for specific frequencies. These can be used to (1) determine the size of area to prepare for disposal of runoff from a specific feedlot, (2) plan for the use of feedlot runoff as a source of irrigation water, (3) predict the climatic or moisture conditions at times when holding ponds must be dewatered and (4) evaluate the influence which storage capacity of holding ponds has on frequency of spillage from the ponds and the timing of irrigations with the runoff water. (See also W76-07154) (East Central)
W76-07168

AN ILLINOIS FEEDLOT RUNOFF CONTROL PROJECT,
R. Lawfer.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 93-95.

Descriptors: *Illinois, *Feed lots, *Design, Sprinkler irrigation, *Farm wastes, *Agricultural runoff, Water pollution control, Waste treatment.
Identifiers: *Runoff control, Settling basin, Land spreading.

Reported are the experiences and observations of a farm owner-operator concerning the operation of a livestock waste management system installed on his farm in northwestern Illinois in the summer of 1973. This project was designed to prevent possible point source pollution from this feedlot, and to provide needed research on water quality, engineering design standards, and on disposition of livestock wastes. A continuing study by the University of Illinois involves collection and analysis of samples of water, plants and soil, to monitor the levels of chemical substances from manure in nearby wells and streams, and in soil. A summary of results is presented. This 'zero runoff' system includes a diversion, earthen dikes, a concrete basin for settling out waste solids, and a holding pond for temporary storage of liquids. Solids from the feedlot and settling basin are moved with solid manure handling equipment and spread on pasture or cropland. All contaminated runoff and liquid wastes from the feedlot are stored until they can be applied to the soil. A small solid set and movable irrigation system is used to empty the holding pond. Liquid from the pond can be applied through sprinklers to seven acres of cropland. Alternatively, a drain pipe allows pond liquid to be applied by gravity to a small area of permanent pasture by use of perforated pipe. An evaluation is presented of the system's performance during eighteen months of operation. Management skills and minor changes in design standards are recommended. (See also W76-07154)(East Central)
W76-07169

FEEDLOT WASTE RECYCLING WITH A FLUSH CLEANING SYSTEM,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
C. L. Barth, and R. W. Goethe.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 96-97.

Descriptors: *Feed lots, *Waste storage, *Waste disposal, *South Carolina, *Design, Farm lagoons, Sprinkler irrigation, Southeast U.S., *Farm wastes, *Recycling.
Identifiers: *Flush waste handling system, *Land disposal.

Due to high rainfall, feedlots in the Southeast United States, require large amounts of labor and equipment to handle animal waste in solid form. Adverse weather conditions and cropping systems prevent continuous operation of solid waste handling equipment on cropland and interrupt work schedules. To combat the waste handling problem and odors, and to reclaim plant nutrients by recycling, Walworth Plantation near Eutawville, South Carolina, constructed in 1973 a 5,000-head capacity feedlot with a (water) flush waste handling system. This type system is not new to the animal industry but is unique in the beef feedlot industry. The feeding layout is constructed in a 'V' shape with 20 pens on each slope. The pens have a uniform slope of 2-1/2% to a central collection canal. Each pen is 30 feet wide, 120 feet long with a capacity of 125 head of cattle. The pens are constructed back to back with an unpaved working alley between the rows of pens. The central collection ditch diverts all runoff waste and water into a large concrete holding tank equipped with an agitator. The waste is agitated and pumped with a manure pump to a sprinkler irrigation system. The waste is applied on forage crops and pastures. As a back-up system in case of mechanical failure or prolonged adverse weather conditions, a 2-1/2-acre excavated lagoon and a 15-acre natural lagoon can be used to prevent discharge to streams and to comply with effluent guidelines for the feedlot industry. (See also W76-07154) (East Central)
W76-07170

EVALUATION OF DAIRY, BEEF AND SWINE WASTE HANDLING SYSTEMS,
Michigan State Univ., East Lansing.
R. L. Maddex, T. L. Loudon, L. R. Prewitt, and C. H. Shubert.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975. p 104-106.

Descriptors: *Livestock, *Dairy industry, *Confinement pens, *Waste storage, *Design, Agricultural runoff, Nutrients, Labor, Maintenance, Waste treatment, *Farm wastes, Hogs.
Identifiers: *Waste handling, Waste accumulation rates.

A variety of systems for handling and storage of animal waste have been constructed in the last few years. Some of these have been designed by Soil Conservation Service personnel or Extension agricultural engineers, but others have been planned and built by farmers themselves often patterned after systems they have observed on other farms. A study to evaluate the design criteria, labor requirements, mechanical maintenance, and level of management associated with these systems has been initiated. Seven dairy farms were initially selected for waste management studies. Two of the farms are total confinement operations with the remaining five having a combination of free-stall and outside paved lots. All but one farm have manure storage facilities. Runoff collection ponds are in operation on each of the farms that have outside lots. The project is being expanded to include additional dairy farms with different waste handling techniques as well as beef and swine facilities. Waste handling techniques on each of the farms under study are described. (See also W76-07154) (East Central)
W76-07171

LARGE PISTON MANURE PUMPS AND OUTSIDE MANURE STORAGES (EARTHEN BASINS),
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
R. E. Graves.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975. p 107-111.

Descriptors: *Dairy industry, *Pumped storage, Lagoons, Wisconsin, Equipment, Costs, Design, Farm wastes, Central US, *Farm lagoons.
Identifiers: Midwest U. S. Solid piston pump, Hollow piston pump.

Because storage tanks under dairy barns of barnyards have such problems as high construction costs, gases and odors, and ventilation problems, some midwest dairymen are turning to storage ponds and lagoons. In the past conveying manure to these structures by means of tractor scrapers of conventional manure handling equipment has had its problems. In 1972, large piston manure pumps became commercially available in Wisconsin. These pumps provide an automatic method for manure removal from a barn to an outside storage structure. Manure may be conveyed through up to 200 ft of 10 in or 12 in pipe to the bottom of a storage area. The two variations in pumps are a solid piston pump which handles manure with or without long fibrous material, and a hollow piston pump which handles manure without long fibrous material. The hollow piston pump is cheaper and more readily available and is presently the most popular with free stall barns. Experiences with these systems are described, particularly agitation and emptying of these rather large (100 in to 200 in) earthen storage units. Various designs, pumping units and management methods are used. (See also W76-07154) (East Central)
W76-07172

ADAPTATION OF A BRITISH WASTE MANAGEMENT SYSTEM TO THE U.S. ENVIRONMENT,
Howard Harvestore Ltd., Bury St. Edmonds (England).
P. Jensen, G. Newman, and A. J. Peters.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975. p 117-120.

Descriptors: *Waste storage, *Slurries, Design, Testing, *Farm wastes, Waste treatment.
Identifiers: *Waste management, *United Kingdom, Harvestore.

In the United Kingdom extensive and increasing use is being made of livestock waste management systems which feature above ground storage of liquid manure during seasons of the year when spreading on fields is either impossible because of bad weather or impractical because of poor timing for fertilizer application. Two factors have stimulated this activity--anti pollution legislation and the rapidly increasing cost of chemical fertilizers.

Howard Harvestore, Ltd., has been successful in the application of open top, above ground liquid manure storage vessels, called slurrystores, made of glass-coated steel Harvestore sheets. Their success in the U.K. environment has prompted much interest on the part of U.S. Harvestore dealers who want to apply the same kind of equipment to livestock pollution control in the U.S. Therefore a product design and development project, reported here, was set up with the purpose of testing the suitability of the slurrystore system in the U.S. environment, where seasonal temperatures both far above and far below the norm in England might make direct adaptation of the English system difficult. During the winter and spring of 1974, operational testing was conducted with four prototype systems, including two in Wisconsin, one in Missouri and one in Texas, with a variety of types and makes of pumps for loading, recirculating (agitating) and unloading the slurrystore structures. Some unexpected problems did arise but have been successfully resolved and the general conclusion is that the above ground slurrystore system, properly equipped and managed, can solve the farmer's waste management problem, and prevent pollution of streams. (See also W76-07154) (East Central)
W76-07173

A WASTE MANAGEMENT SYSTEM FOR A 150-COW DAIRY--A 10-YEAR CASE STUDY,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
A. C. Dale, J. L. Albright, J. C. Nye, and A. L. Sutton.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975. p 126-129.

Descriptors: *Farm lagoons, *Dairy industry, Lagoons, *Irrigation, Clogging, Pumping, *Farm wastes.
Identifiers: *Waste handling.

Some of the problems and successes of the waste handling facilities at the 150-cow Purdue Dairy Farm Center are described. Odor complaints and large labor load caused the farm to modify their solid waste handling facilities so that all wastes could be handled as a liquid. Two 34,000 gallon circular concrete holding pits were constructed. The manure was scraped to these holding pits, diluted with water, mixed and pumped with an impeller manure pump and hauled to nearby fields for disposal. However, odor was still a problem. A small sedimentation lagoon was constructed to control excess runoff. An aerator was placed in it to control odors. Later, a large anaerobic lagoon was constructed which received all the wastes. It was de-watered annually by conventional irrigation equipment. However rapid increase in solids level caused clogging problems in the nozzles. In 1973, a large 40 hp pump was employed to drive the irrigation system. It also developed clogging problems. The final solution for dewatering the lagoon was two pumps in series. The first pump was a large capacity trash pump; the second was the 40 hp unit. Experience with this system led to several conclusions. Material which will not decompose should not be added to lagoons to be used with irrigation systems. If mechanical and hydraulic devices are to be employed, some method of keeping the large non-biodegradable particles out of the waste is necessary. A solid waste handling should still be used for handling the lot scrapings particularly if bedding is used with large particles in it. If these large solid materials are removed, the lagoon system with irrigation dewatering works well for handling the dairy lot runoff. (See also W76-07154) (East Central)
W76-07174

A PLANNING STUDY ON DAIRY WASTES MANAGEMENT,
Webb (Albert A.) Associates, Riverside, Calif.
S. I. Gershon, S. A. Hart, A. C. Chang, and J. W. Branch, Jr.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975. p 132-135.

Descriptors: *Dairy industry, *California, *Water pollution, *Groundwater, *Salts, Regulation, Planning, Waste treatment, Farm wastes, Evaluation.
Identifiers: Land disposal, Compost.

The major milkshed for Los Angeles, California is in the Chino Basin of the Santa Ana River Watershed, 25 miles east of Los Angeles. Approximately 165,000 dairy cows are located within a 120 square mile area. The manure from these animals is either applied to nearby farm fields or exported as compost. Nevertheless, mismanagement of waste storage and disposal contributes to surface and groundwater pollution problems. Concern about water pollution prompted the Santa Ana Watershed Planning Agency to retain consultants to study and recommend various management plans, including waste handling from various pollutant contributors. In one study, the consultants hoped to determine economically feasible methods by which the amount of salts added (about 50,000 tons of salt - total dissolved solids - per year) to the groundwater basin from the dairy industry could be reduced by 90%. An extensive data-gathering program was initiated. The extent of the salt problem was determined. Alternative means of collection, treatment, and disposal of the waste streams were evaluated. An economic analysis of the feasible alternative methods was made along with recommending a plan. Study results are given in detail. (See also W76-07154) (East Central)
W76-07175

MANURE PONDS FOR MINIMIZING POLLUTION,
Soil Conservation Service, Kewaunee, Wis.
A. C. Marini, O. J. Berry, and M. L. Knabach.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p 141-143.

Descriptors: *Farm wastes, *Farm ponds, Farm lagoons, *Wisconsin, *Dairy industry, Costs, Design, Waste storage, Equipment, Water pollution, Waste treatment.
Identifiers: *Waste handling, Land disposal.

Wisconsin has long been noted for the production of dairy products. Throughout the years, the size of the dairy farms has steadily increased. However, the proximity of many of the livestock yards to perennial streams, many of which are trout streams, has not changed. As a result, the larger herds have increased the problem of handling the large volumes of manure produced each day. One method of handling these livestock wastes involves the use of manure pumps. Although the companies which fabricate manure pumps are few, a considerable number of these installations have been made. Many of these systems have been very successful. The manure has been removed from the buildings and successfully stored for the desired period of time while greatly reducing surface water pollution. The design and operation of a complete manure handling system for a farm located in Kewaunee County are described. Although this system was relatively inexpensive, the capacity is sufficiently large to store the total manure accumulation of 100 cattle for the entire winter season. Three major items are discussed: (1) the design of the overall waste management system, (2) the operation of the system including the application of the animal wastes onto the land in a manner which eliminates pollution, and (3) the equipment used and the storage facilities which effectively use earth embankments to store the waste. (See also W76-07154) (East Central)
W76-07176

A TOTAL RECYCLE UNIT SYSTEM FOR DAIRY MANURE MANAGEMENT,
Purdue Univ. Lafayette, Ind. Dept. of Agricultural Engineering.
A. C. Dale, and R. Swanson.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p 144-146.

Descriptors: *Recycling, *Dairy industry, *Waste treatment, Slurries, Fertilizers, *Farm wastes.
Identifiers: Pollution control, Bedding, Soil conditioner, Refeeding.

Described is the Total Recycle Unit (TRU) System, developed by Babson Bros. Co., Oak Brook, Illinois, to mechanically handle and treat dairy cow manure. With the TRU System, part of the manure is converted to readily reusable products and the remainder is converted into non-pollutional end products. A field trial unit is undergoing final observations and monitoring prior to tooling up for production in the near future. The complete TRU System processes raw dairy cow manure as follows: (1) homogenizes the manure into a slurry in a primary collection tank, (2) pumps the slurry through a solids-liquid separator, (3) washes the first separated solids with 'clean' water to further remove mucous and dissolved solids, (4) ejects washed and final separated solids to storage for use as bedding, as a soil conditioner, or for refeeding to beef cattle, (5) returns some liquids to the mixing tank to dilute the incoming manure, (6) pumps the remaining liquid to the following: (a) storage for holding until irrigated onto cropland, (b) an aerator and thence to an electroflocculator for removal of minerals, (7) pumps the colored water through a clarifier producing a clear reusable or dischargeable water. In summary, the complete TRU System produces 'clean' solids, concentrated fertilizer and clarified water from dairy cow manure. However, only part of the system may be selected. For example, the electroflocculator could be eliminated with the liquid going directly to the holding unit for eventual use as a fertilizer or a substrate for bacteria to synthesize into proteins. (See also W76-07154) (East Central)
W76-07177

SWINE PRODUCTION AND WASTE MANAGEMENT: STATE-OF-THE-ART,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
M. R. Overcash, F. J. Humenik, and L. B. Driggers.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p 154-159.

Descriptors: Economics, Reviews, *Farm wastes, *Waste treatment, *Hogs.
Identifiers: *Waste management, *Pork production.

An exhaustive review of over 100 pertinent articles has been compiled in association with an EPA grant to critically evaluate the composite production-waste management strategies in the United States. A comprehensive systematic survey of the pork production industry was also conducted to add dimension to assessment of actual producer operations and problems relative to waste management options. This combined literature review and survey can provide excellent direction for future regulations and pork industry growth patterns. Information from literature references, extensive data retrieval and calculations have put the available waste characterization data on a uniform and thus more useable basis. The raw waste load and waste stream from various composite production-pretreatment systems are included for such parameters as liquid volume, COD, TOC, TKN, NH3-N, PO4-P, solids, K and trace elements. Finally a regrouping of traditional production

systems to reflect waste management considerations and economic costs for final application to plant-soil receiver systems is included. Such unit definition ranges from those with large volumes of wastewater or high nitrogen contents to those with minimal water and nitrogen in the waste stream. A discussion of the minimum cost effective parameters which could be monitored to evaluate or regulate performance of a waste management system with a terminal plant soil receiver system is included. (See also W76-07154) (East Central)
W76-07178

SWINE WASTE NUTRIENT RECOVERY SYSTEM BASED ON THE USE OF THERMAL DISCHARGES,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
J. R. Miner, L. Boersma, J. E. Oldfield, and H. K. Phinney.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p 160-163.

Descriptors: *Recycling, Anaerobic digestion, Algae, Methane, Design, *Hogs, *Farm wastes, Water reuse, Thermal pollution, Waste treatment.
Identifiers: *Nutrient recovery system, *Thermal discharges, *Single cell protein.

The feasibility of using waste heat from steam electric plants to sustain a food producing complex in which nutrients are recycled is being analyzed. Microorganisms are being used to convert animal manures into a high protein livestock feed and a methane rich fuel gas. Waste heat from the steam electric plants is used as a low cost source of energy for maintaining stable, elevated temperatures in anaerobic digestion and single cell protein production units. Much of the technology of the individual units is currently available. The objective of this project was to develop a system utilizing these units together and to establish design and operating criteria. The system consists of anaerobic digestion for liquifaction of solid material and soluble nutrient recovery by growing algae in basins heated with waste heat. The components of the system include: hydraulic manure transport, a solid-liquid separator, an anaerobic digester, aerobic basins for growing algae, harvesting equipment, and a soil-bed filter system for final removal of nutrients. The nutrient requirements of algae cultures are similar to the waste characteristics from swine. The design of the facility is based on the waste production of fifty swine. The facility is a livestock confinement building where the manure is flushed from the animal pens and routed to the nutrient recovery system. Flushing is done with sufficient frequency to prevent anaerobic decomposition and associated odors within the building. Clarified liquid from the nutrient recovery system is re-used in the process to flush wastes from the building. (See also W76-07154) (East Central)
W76-07179

MANAGING A SUCCESSFUL LIQUID SWINE MANURE MANAGEMENT SYSTEM,
Leanco Corp., Brownwood, Tex.
P. R. George, J. M. Sweeten, and S. P. Buchanan.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p 164-167.

Descriptors: *Liquid wastes, *Waste treatment, *Farm, Lagoons, *Farm wastes, *Hogs, Waste disposal, Management.
Identifiers: Storage pits, Land disposal.

A modern 600-sow farrow to finish operation in Central Texas employs a three-phase system of efficiently managing liquid swine manure. The feeding system consists of two farrowing houses, two adjoining nurseries and eleven partially-covered finishing buildings. The two enclosed slatted-floor farrowing houses are underlain by ventilated 4 ft deep liquid manure storage pits. Separate storage pits are provided for each 30-sow room within the farrowing house to facilitate clean-out and enhance disease control. In all other buildings, liquid manure pits (beneath fully and partially-slatted floors) extend the length of the buildings. Anaerobic treatment is provided in these continuous flow storage pits, which have a theoretical manure storage capacity (detention time) of 70 days. The operators withdraw settled solids from the storage pits without agitation at two to three week intervals using honey wagons. This method of sludge handling was compared with chemical treatment of the pits from the standpoint of odor control. Sludge is hauled to adjacent fields and disposed of through plow-furrow-cover. Odors and flies are effectively controlled. No additional fertilizer is needed on the 100 acres of Coastal Bermuda grass pasture. Liquid overflow from the manure storage pits is conveyed 1/2 mile into a facultative/anaerobic lagoon for further treatment and eventual land disposal. This lagoon also receives runoff from the 100-acre solids disposal area and is designed to contain the 25 year frequency, 24 hour duration storm. Besides meeting the zero-discharge standard for both the feeding area and manure disposal area, the operation has been monitored for possible groundwater pollution problems. Piezometers have indicated no evidence of seepage from either the lagoons or from the liquid manure storage pits. (See also W76-07154) (East Central)
W76-07180

TOTAL WASTE MANAGEMENT FOR A LARGE SWINE PRODUCTION FACILITY,
F. J. Humenik, R. E. Sneed, M. R. Overcash, J. C. Barker, and G. D. Wetherill.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 168-171.

Descriptors: *Costs, Sprinkler irrigation, Ammonia, *Waste treatment, *Farm wastes, *Hogs, Management, *Farm lagoons, Aerated lagoons.
Identifiers: *Waste management, Land disposal, Zero discharge, Volatilization, Aerated basin, Anaerobic lagoon.

Consistent with developing animal waste management technology, this total system is centered around nitrogen and the pretreatment processes prior to terminal land application for the most feasible approach to a zero discharge system. The maximum production capacity of this breeder facility is about 200,000 lb on farm liveweight. Facilities have been developed to minimize wastewater generation in the totally enclosed buildings with manure storage pits under partially slatted floors. Site alterations included creek rerouting to optimize the production-waste management system. Wastewater pretreatment processes are a surface aerated basin (87,000 ft3) followed by an unaerated anaerobic lagoon. In addition, liquid from the unaerated lagoon is applied to a 1.5 acre site in which overland flow pretreatment is accomplished with this wastewater returningto the unaerated lagoon. Piping in conjunction with the overland flow and terminal irrigation system also allows use of secondary lagoon water for pit precharge and positive cleaning after pit emptying. These pretreatment processes effect nitrogen losses by ammonia volatilization and nitrification-denitrification as well as some degree of odor control. Final treatment or disposal of lagoon effluent is accomplished by a permanent set sprinkler system with manual control of laterals. The operational strategy, installation costs, and on-going costs are included. (See also W76-07154) (East Central)
W76-07181

TWO-STAGE ACTIVATED SLUDGE TREATMENT OF EFFLUENT FROM INDUSTRIAL HOG BREEDING FARMS,
Institute for Water Management, Bucharest (Rumania).
C. A. L. Negulescu.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 184-185.

Descriptors: *Activated sludge, *Waste treatment, *Farm wastes, *Waste water treatment, *Hogs, Effluents.
Identifiers: *Romania.

One of the problems which may be solved by the activated-sludge process is the treatment of effluents from industrial hog breeding farms. Romania has applied the system to breed hogs in a very limited area (structures of agro-industrial type for 100-150 thousand hogs). Since waste disposal by landspreading requires a large agricultural area, the possibility to treat the waste before disposal was considered.Studies started with the characterization of wastes; the results obtained are given as specific load (per capita). A few mechanical and natural-biological treatment plants were built but , the severe discharge conditions in some parts of the country required more efficient methods of treatment. The conventional methods used in sewage treatment have been tried with good results. On a laboratory scale (1970) and on full-scale (1972-73) Results of hog waste settling followed by two stage activated-sludge treatment were very hopeful (more than 95% efficiency). (See also W76-07154) (East Central)
W76-07182

DIRECT LAND DISPOSAL OF FEEDLOT RUNOFF,
Agricultural Research Service, Lincoln, Nebr.
N. P. Swanson, C. L. Linderman, and L. N. Mielke.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 255-257.

Descriptors: *Agricultural runoff, Nutrients, Irrigation, Design, *Waste disposal, *Farm wastes, *Feed lots.
Identifiers: *Land disposal, Field sink, Serpentine waterway.

Land disposal of collected feedlot runoff permits utilization of nutrients and of the water as irrigation. Runoff supplies, however, are not dependable, and facilities and equipment for storage and irrigation distribution require a minimum investment and periodic management irrespective of the size of the feedlot enterprise. Distant overland flow of feedlot runoff, under natural topographic conditions, prior to ultimate discharge into a stream has been judged not to be an environmental hazard in many states. Many feeders would prefer to assume some soil and crop management problems for direct disposal of runoff in lieu of storage and later distribution. This alternative is possible with the use of a field sink on a reasonably level disposal area or a serpentine waterway on a sloping site. Both are described in detail. Direct application on the land can save both investment and time for the many feeders with smaller facilities, and provide adequate protection for the environment. (See also W76-07154) (East Central)
W76-07183

DISPOSAL OF BEEF FEEDLOT WASTES ONTO LAND,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
H. L. Manges, R. V. Lipper, L. S. Murphy, and W. L. Powers.

In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 261-263.

Descriptors: *Feed lots, *Cattle, Kansas, *Crop response, Salts, Nitrogen, Equations, Agricultural runoff, *Farm wastes, *Application water.
Identifiers: *Land disposal, *Soil cores.

The objectives were to determine the optimum feedlot waste application rates onto land with a minimum of pollution to land and the ground water. The research was conducted in cooperation with the Pratt Feedlot, Inc., a 35,000 head commercial feedlot in Southcentral Kansas. Feedlot runoff and feedlot manure were spread onto different land areas at varying application rates for five years. Corn was grown on the waste disposal area. The corn was furrow irrigated from a well as needed for high corn yields. Feedlot runoff application rates were determined from inflow-outflow measurements in the irrigated furrows. Feedlot manure application rates were determined from the weight of manure caught on strips of plastic during spreading. Corn forage yields were measured by weighing forage mechanically harvested from test row. Soil cores were taken annually and analyzed to determine changes in chemical composition. Highest corn forage yields were obtained at waste application rates in excess of those necessary to supply the recommended nitrogen fertilization rates. However, there was a buildup of salts and nitrogen in the soil. At waste application rates necessary to supply the recommended nitrogen fertilization, corn forage yields were near maximum and salt and nitrogen buildup in the soil were not significant. Corn forage yield prediction equations have been developed from yield data from the waste disposal studies. These equations will be used in determining the most economical waste application rates, both feedlot runoff and manure. (See also W76-07154) (East Central)
W76-07184

DAIRY LAGOON SYSTEM AND GROUNDWATER QUALITY,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-07185

SEEPAGE BENEATH FEEDYARD RUNOFF CATCHMENTS,
Southwestern Great Plains Research Center Bushland, Tex.
For primary bibliographic entry see Field 5B.
W76-07186

NUTRIENT LOSSES FROM MANURE UNDER SIMULATED WINTER CONDITIONS,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-07187

ANIMAL WASTE CONTRIBUTION TO NITRATE NITROGEN IN SOIL,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5B.
W76-07188

EFFECTIVENESS OF FOREST BUFFER STRIPS IN IMPROVING THE WATER QUALITY OF MANURE POLLUTED RUNOFF,
Maryland Univ., College Par., Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-07189

EFFECT OF ANAEROBIC SWINE LAGOONS ON GROUNDWATER QUALITY IN HIGH WATER TABLE SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-07190

OPTIMUM DILUTION OF SWINE WASTES FOR GROWTH OF LEMNA MINOR L. AND EUGLENA SP,
Tennessee Valley Authority, Muscle Shoals, Ala. Environmental Biology Branch.
R. A. Stanley, and C. E. Madewell.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975. p 331-333.

Descriptors: *Fish diets, Algae, Oxygen, *Farm wastes, Hogs, Waste dilution, *Anaerobic condition, Tennessee Valley Authority, *Ponds, *Loading rates, Phytoplankton, Fish reproduction.
Identifiers: Anaerobic lagoons, Pond enrichment.

One means of animal waste disposal is the use of wastes to enrich enclosed ponds for increased production of fish or shellfish. This approach is being used at Woods Hole Oceanographic Institute for marine shellfish, and should work equally well for freshwater systems. Three possible systems that TVA intends to test are (1) Lemna minor L. (or some other duckweed) consumed by white amur, (2) algae consumed by a freshwater shellfish, and (3) algae consumed by phytoplanktivorous fish such as silver amur. The proper dilution rate for L. minor L. and phytoplankton was determined in glazed ceramic containers under greenhouse conditions. Containers held 8 l of fluid and had 350 cm2 surface area. Fluid for waste enrichment was obtained from a local primary treatment lagoon (anaerobic) that receives wastes from a swine feeding operation. Additions were made three times per week. L. minor L. from a local pond was added at 10 g fresh weight per container. Inocula for phytoplankton were obtained from a dilution series that had been spiked with seven water samples containing natural phytoplankton flora. About 2 g fresh weight of mixed phytoplankters was used to innoculate the experimental dilution series. Plants were harvested once a week, dried overnight at 70C, and weighed. Oxygen was determined with a YSI model 53 oxygen monitor. Loading rate for optimum growth of L. minor L. was 19 ml/l/wk. Dissolved oxygen during the day at this loading rate was normal (saturated), while at night oxygen was about one-half normal (saturated). Maximum growth of Euglena sp. was obtained at 150 ml/l/wk. Day and night oxygen concentrations at this loading rate were below 2ppm, a level reported to be tolerated by Asiatic clams and silver amur but considered dangerously low. The highest loading rate at which dissolved oxygen remained above 2 ppm, both day and night, was 38 ml/l/wk. (See also W76-07154) (East Central)
W76-07191

SWINE WASTE LAGOONS AS POTENTIAL DISEASE RESERVOIRS,
Iowa State Univ., Ames. Dept. of Veterinary Pathology.
For primary bibliographic entry see Field 5B.
W76-07192

ESTIMATING QUANTITY AND QUALITY OF RUNOFF FROM EASTERN BEEF BARNLOTS,
North Appalachian Experimental Watershed, Coshocton, Ohio.
For primary bibliographic entry see Field 5B.
W76-07193

MANAGEMENT OF IRRIGATION FOR DISPOSAL OF FEEDLOT RUNOFF IN COLD CLIMATES,
North Dakota State Univ., Fargo.
R. W. Schottman, C. W. Thoreson, and J. K. Koelliker.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975. p 416-420.

Descriptors: *Irrigation, *Agricultural runoff, *Feed lots, North Dakota, Model Studies, Design, Climates, *Pumping, *Farm wastes, Management, *Waste disposal, Waste treatment.
Identifiers: Detention ponds.

Management of the pumping of livestock runoff to be used for irrigation is considered for several locations in North Dakota. Pumping durations, pumping rates and detention pond size and shape are simulated for stations having contrasting climatological conditions. Runoff events are predicted and are compared to the 10-year and 25-year, 24 hour storms for each station. All stations are characterized by at least a 90 day period of continuously frozen conditions and by a growing season of approximately 120-130 days. Runoff is predicted using a model similar to that developed by Larson at the University of Minnesota. The model has been expanded to allow specification of pumping rates and duration as well as pond size and shape. At least 30 years of daily precipitation and temperature records were used as input data for each station. The SCS runoff model is used as the basis for predicting the size of each runoff event. Runoff and pumping programs for two commercial feedlot operations were monitored and the observed water levels and runoff events were compared with predicted values. Design recommendations are proposed for the rather unique climatological conditions encountered in North Dakota. The model's applicability to other climatological conditions is also demonstrated. (See also W76-07154) (East Central)
W76-07194

DESIGN RUNOFF VOLUME FROM FEEDLOTS IN THE SOUTHWESTERN GREAT PLAINS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 5B.
W76-07195

QUANTITY AND QUALITY OF BEEF FEEDYARD RUNOFF IN THE GREAT PLAINS,
Southwestern Great Plains Research Center. Bushland, Tex.
For primary bibliographic entry see Field 5B.
W76-07196

PROPERTIES OF SOLIDS AND LIQUIDS FROM STACKED MANURE,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-07197

A LAGOON-GRASS TERRACE SYSTEM TO TREAT SWINE WASTE,
Missouri Univ., Columbia. Dept. of Agricultural Engineering.
D. M. Sievers, G. B. Garner, and E. E. Pickett.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 541-543.

Descriptors: *Waste treatment, *Anaerobic lagoons, *Performance, Effluents, Hogs, *Farm wastes, *Farm lagoons.
Identifiers: *Lagoon-grass terrace system, Chemical build-up.

The waste management system for a swine finishing unit (200 hd) was studied to determine its treatment effectiveness and to assess the system's effect on a nearby municipal water supply reservoir. The system consisted of a slotted floor over an anaerobic lagoon and an 850 ft. grassed terrace. During precipitation events, the lagoon discharged to the terrace where renovation and dilution of the effluent occurred. Leaving the terrace, the liquid flowed an additional 800 ft. and entered the small arm of a municipal water supply reservoir. The anaerobic lagoon was malfunctioning biologically due to chemical build-up. Attempts were made to improve biological activity in the lagoon by pumping the liquid fraction and diluting the sludge with fresh water. Samples of the lagoon effluent and flow in the terrace were analyzed for 14 chemical and physical parameters during a 0.9 inch precipitation event. Over 80 percent reductions in the concentrations of total volatile solids, Zn and Cu, and over 90 percent reductions in COD, BOD5, TKN, total P, Na and K were achieved in the terrace. Soil samples (to 4 ft., taken along the terrace channel) indicated that most chemicals held by the soil were largely removed in the first 200 ft of terrace. Controlled discharge of the lagoon coupled with the grassed terrace proved effective in protecting the reservoir from pollution. Annual pumping of the lagoon liquid and dilution of the sludge with pond water produced an average reduction of 50 percent of all measured parameters and resulted in improved biological activity. However, chemical concentrations built up within one year to higher levels, suggesting that the sludge must be removed to maintain a non-toxic environment in the lagoon. (See also W76-07154) (East Central)
W76-07198

PRESENT KNOWLEDGE ON THE EFFECTS OF LAND APPLICATION OF ANIMAL WASTE,
Kansas State Univ., Manhattan. Dept. of Agronomy.
G. W. Wallingford, W. L. Powers, and L. S. Murphy.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p 580-582.

Descriptors: Soils, Physical properties, Chemical properties, *Farm wastes, *Waste disposal, *Application rates, *Reviews, *Waste treatment.
Identifiers: Literature review, *Land disposal, Loading rates.

The purpose was to review the literature and analyze research needs on the effects of land disposal of animal waste. A secondary objective was to assemble published information on application guidelines for animal waste. Included is information on characteristics of the waste, effects of waste on soil and water near the application site, loading rates, application techniques and research needs. All usable waste characterization data were compiled and classified by climatic region, species (animal), and type (liquid or solid) of waste. The variability in composition within a climatic region, species and type of waste was so great that no general characterization could be made within each classification. Factors affecting the composition of the waste are discussed. Effect of land disposal on the physical, chemical and biological properties of the soil are discussed as well as its effect on groundwater quality below the disposal site, runoff quality from the disposal site, and plant growth on the disposal site. Benefits of animal waste disposal as well as the hazards of animal waste disposal on land are discussed. (See also W76-07154) (East Central)
W76-07199

ON-THE-FARM DETERMINATION OF ANIMAL WASTE DISPOSAL RATES FOR CROP PRODUCTION,
Washington State Univ., Pullman. Dept. of Soil Science.
D. O. Turner.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 587-590.

Descriptors: *Waste disposal, *Pacific Northwest U.S., *Crop response, *Farm wastes, Denitrification, Leaching, Equations, Dairy industry.
Identifiers: *Waste management, *Disposal rates.

Livestock operators in the Pacific Northwest need a means whereby they can estimate waste loading capabilities of their soils. Seventy percent of the 300,000 dairy cows in Washington and Oregon are west of the Cascade mountains in areas having heavy winter rainfall. Waste disposal poses pollution problems which are especially troublesome when alluvial soils are saturated. Waste handling and transport systems in conjunction with field applications are under study at three dairy locations; cattle populations range from 130 to 350 head. Two installations receive 40 to 60 inches annual precipitation; one gets 20 inches annual rainfall. Detention ponds for winter storage and pumppipe distribution systems are used at all locations. A soil injection system is also used at one site. Tile drainage effluent from beneath lagoons is being monitored for NO3-N and coliform bacteria at one location. The effluent is less polluted than the stream into which discharge occurs. Waste loading rates are being defined at all locations under field conditions. Crop removal of nitrogen is being measured with silage corn, cereal rye, and forage grasses. Nitrate-nitrogen concentrations in the forage are being determined as are NO3-N concentrations in the soil profile to a 4-foot depth. Results indicate large amounts of animal manure can be applied to soils in the Northwest without accumulation of toxic NO3-N in animal feed. A large amount of nitrogen is being denitrified. Soil nitrate leaching is minimal in the operations. (See also W76-07154) (East Central)
W76-07200

DISPOSAL OF DAIRY CATTLE MANURE ON SOIL,
Agricultural Research Service, Auburn, Ala.
Z. F. Lund, F. L. Long, B. D. Doss, and F. E. Lowry.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 591-593.

Descriptors: *Dairy industry, *Cattle, *Soils, *Crop response, *Forages, *Agricultural runoff, *Waste disposal, *Farm wastes.
Identifiers: *Land disposal.

Dairy cattle manure was incorporated into the surface 15 cm of a Norfolk sandy loam cropped with millet (Pennisetum americanum (L.) K. Schum) and rye (Secale cereale). Applications of 45 mt/ha/yr for 3 years resulted in BOD values of runoff water that did not exceed those for non-manured plots. The nitrate-nitrogen content of runoff water was essentially unaffected by the manure treatment. The same cropping system was used on plots of Dothan loamy sand, Lucedale sandy loam, and Decatur clay loam. Plots received 22.5, 45, 90, 180, and 270 mt/ha/yr of manure on a dry weight basis. The check plot received N, P, and K fertilizers totalling 450, 220, 450 kg/ha. The 180- and 270-ton manure rates caused plant injury the first year on both sandy soils. Millet yields were higher at the 45- and 90-mt/ha rates than on the check plots 2 out of 3 years. Both millet and rye forage produced on 180- and 270-mt/ha treatments had K/(Ca+Mb) ratios and nitrate levels that were potentially hazardous to animal health. Coastal bermudagrass (Cynodon dactylon (L.) Pers.) on Dothan and Lucedale soils received rates of 45 and 90 mt/ha/yr of solid manure and 45, 90, and 135 mt/ha/yr of liquid manure. Four applications of N, P, and K fertilizers were made to the check plots annually for a total of 470, 225, and 470 kg/ha. The mineral fertilizer plots yielded more forage the first year on the Dothan soil, and the second and third years on the Lucedale soils, than any manure treatment except the 90 and 135 mt/ha of liquid. Nitrate nitrogen in the forage was highly correlated with organic nitrogen in the plant tissue. Manure could be applied at the 45 mg/ha rate, either incorporated or on a Coastal bermudagrass sod, and produce nontoxic forage. (See also W76-07154) (East Central)
W76-07201

POLLUTION ABATEMENT OF POULTRY MANURE BY MAXI-MIXING METHOD,
Connecticut Univ., Storrs. Dept. of Animal Science.
W. A. Aho, G. F. Griffin, and A. K. Bakir.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 602-605.

Descriptors: *Poultry, *Costs, *Waste disposal, *Sampling, Nitrates, Nutrients, Anaerobic conditions, *Pollution abatement, Mixing, Waste treatment, *Farm wastes.
Identifiers: Maxi-mixing, *Composting.

Maxi-mixing is a term coined to describe a manure disposal system using a maximum amount of manure and a minimum amount of soil in a composting situation. Manure is returned to the soil system in massive quantities at low cost. Actual mixing is accomplished with a bulldozer or a payloader, folding manure and soil and windrowing. Odors are quelled almost immediately and under ideal temperature and aeration, composting occurs in several weeks. In November of 1970, 3,675 tons of poultry manure (59 tons nitrogen) were mixed in an area less than 2 acres. The area was too small to provide enough soil for a windrowed compost. The manure remained below ground level in a wet anaerobic state. The area surrounding this mass was sampled for nitrate and ammonia movement in 1971 and 1972. A brook flowing adjacent to the mix was monitored in 9 locations; 12 holes were also drilled to obtain ground water samples, and the farm well was sampled. No appreciable amounts of nitrates were found. The mix lay fallow from November, 1970 until April, 1974, when the site was required for disposal of another 6,300 tons of poultry manure. The site was appraised and soil sample analyses were made. The analyses of soil three years following massive manure mixtures indicated high pH values (8.1 to 8.2) in manure residual zones, relatively high soluble salts (83 to 90 mhos x 10 -5), very high ammonium levels (400 microgram N/g soil) and very high levels of extractable calcium, phosphorus and potassium. Only a trace of nitrite was found in the samples. After the second maxi-mix water samples taken from the adjacent brook and the farm well, showed no pollution from the maxi-mix. Cost of maxi-mixing was 62 cent/ton in 1970 and 60 cent/ton in 1974. (See also W76-07154) (East Central)
W76-07202

ON LAND DISPOSAL OF LIQUID ORGANIC WASTES THROUGH CONTINUOUS SUBSURFACE INJECTION,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
J. L. Smith, D. B. McWhorter, and R. C. Ward.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 606-610.

Descriptors: Liquid wastes, *Design, *Costs, Dairy industry, Labor, Colorado, *Waste disposal, *Farm wastes, Application rates, Injection.
Identifiers: *Land disposal, *Subsurface injection.

Design, development, and utilization of a continuous liquid manure subsurface injection system are discussed. With the system, liquid manure is pumped from a holding tank or lagoon to a disposal field through rigid pipe. A 660 foot flexible hose is used to connect the pipeline to the mobile injector. The manure is injected at depths of 4 to 6 inches below the soil surface and mixed with soil thus minimizing the possibility for aesthetic pollution. The injector can be operated with a medium sized agricultural tractor. Disposal capacity ranges from 400 to 800 gpm of 5% solid slurry depending upon the size of the equipment. A skilled operator can achieve application rates in excess of 50,000 gallons per acre per pass. The system is particularly adapted for use near population centers. The system is presented as an economically and environmentally sound alternative to current practices. Measurements of ground and surface water contamination are reported from on-going research where the system is being used on a dairy in Northern Colorado. The system offers significant savings in labor while improving the aesthetics of animal waste management. Operating costs are competitive with present systems. (See also W76-07154) (East Central)
W76-07203

EXTENDED PLAIN SEDIMENTATION,
West Pakistan Univ. of Engineering and Technology, Lahore.
K. M. Yao.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. EE3, Proceedings paper No. 11392, p 413-423, June 1975. 6 fig, 7 ref.

Descriptors: *Environmental engineering, *Sedimentation, *Suspended solids, *Water treatment, Design, Settling basins, Equations, Flocculation, Waste water treatment.

Extended plain sedimentation could be a possible alternative for pretreatment of surface waters in water purification. It does not add pollution to the environment and its sludge is less objectionable for disposal. Theoretical investigation shows that gravitational effect dominates settling down to the particle size of 1 micron. Experimental results indicate that extended plain sedimentation is technically feasible to remove a substantial amount of turbidity with residual turbidity down to less than 10 FTU. An 88% turbidity removal could be achieved in a settling tank of 7.5-day detention. Suspended solids concentration appears to be more appropriate as an indicator of the performance of settling of natural waters. From the viewpoint of functioning of settling tanks, extended plain sedimentation should mean extension towards a lower design overflow rate rather than towards longer detention periods. (Bell-Cornell)
W76-07204

EFFLUENT IRRIGATION OF PEARL MILLET,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. EE2, Proceedings paper No. 11233, p 193-199, April 1975. 3 fig, 4 tab, 7 ref.

Descriptors: *Agricultural engineering, Environmental engineering, *Irrigation, *Sewage treatment, Water pollution, Measurement, Equations, Nitrogen, Potassium, *Water reuse, Forage.
Identifiers: *Effluent reuse, *Waste water reuse, Nutrient recovery.

The summer forage crop pearl millet (Pennisetum typhoides (Burm) Stapf and E. C. Hubbard), Tiftlate variety, was grown on Lakeland fine sand under irrigation with secondary municipal effluent. Irrigation rates from 2 inches/week to 8 inches/week (50 mm/week to 200 mm/week) were used. Two cuttings were obtained over a 25-week growing period. Dry matter content decreased with irrigation rate, while plant uptake nutrients (except iron) showed an increase. Recovery efficiency of all nutrients measured decreased with application rate. Adequate levels of nutrients for crop fertility were present in the effluent with the exception of potassium. An irrigation rate of 2 inches/week to 4 inches/week (50 mm/week to 100 mm/week) for pearl millet on sandy soil appears quite suitable. (Bell-Cornell)
W76-07205

RECLAMATION OF WOOD-CHIP CARRIER WATER,
North Carolina Board of Water and Air Resources, Raleigh.
J. M. Shane, N. S. Hawthorne, and T. Asano.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. EE2, Proceedings paper No. 11231, p 215-228, April 1975. 10 fig, 5 tab, 8 ref.

Descriptors: *Environmental engineering, *Hydraulic transportation, *Oxidation, *Wood wastes, Adsorption, Biochemical oxygen demand, Chemical oxygen demand, Coagulation, Lime, Pipelines, Water pollution control, Water treatment, *Waste water treatment.
Identifiers: Wood, Carrier water.

One of the major factors affecting the feasibility of hydraulic transport of wood chips is the effect of substances leached from wood chips into the carrier water during the transit period. An investigation was made to determine the feasibility of treating wood-chip carrier water for pollution control or removal of contaminants, or both, for potential reuse. Several treatment operations and processes were investigated, including biological oxidation, chemical coagulation by lime addition, carbon adsorption, and chemical coagulation followed by carbon adsorption. (Bell-Cornell)
W76-07206

LEGAL PERSPECTIVE ON WATER QUALITY MANAGEMENT,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 5G.
W76-07221

OPTIMIZATION OF DENITRIFICATION PROCESS,
Vermont Univ., Burlington. Dept. of Civil Engineering.
R. P. Michael, and W. J. Jewell.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. EE4, Proceedings paper No. 11532, 8 fig, 3 tab, 23 ref. August, 1975.

Descriptors: *Waste water treatment, *Optimization, *Denitrification, *Environmental engineering, Water quality, Hydraulic systems, Kinetics, Mixing, Nitrogen.
Identifiers: *Two phase flow, Microbes, Process control.

A denitrification system composed of a completely stirred tank reactor (CSTR) followed in series with a plug flow reactor (PFR) was tested in order to minimize the disadvantages of each process when used separately. High efficiency of nitrate-nitrogen removal and good process control can be achieved with the series treatment system using 25% of the volume required with a single CSTR reactor. Most influent nitrate-nitrogen concentrations were greater than 1000 mg/l, and these usually result in effluent concentrations less than 0.5 mg/l. The effluent nitrate-nitrogen concentration was reduced to less than 0.5 mg/l with a total hydraulic detention time of 1.7 hr. when the influent nitrate-nitrogen concentration was 80 mg/l. Design conditions which would minimize treatment volume requirements would include microbial mass loadings (grams nitrate nitrogen/grams volatile suspended solids/day) in the CSTR and PFR of 2.0 day, and 0.2 day, respectively, resulting in a 40% removal efficiency in the CSTR reactor and greater than 95% nitrate-nitrogen removal efficiency in the total system. The microbial yield averaged 0.11 grams volatile suspended solids synthesized per gram of chemical oxygen demand removed. (Bell-Cornell)
W76-07225

CLEAN AIR EQUALS DIRTY WATER,
Los Angeles Dept. of Public Works, Calif.
For primary bibliographic entry see Field 5G.
W76-07228

DETENTION STORAGE CONTROL STRATEGY DEVELOPMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
H. G. Wenzel, Jr., J. W. Labadie, and N. S. Grigg.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Proceedings paper No. 12070, Vol. 102, No. WR1, p 117-135, April 1976. 7 fig, 5 tab, 9 ref. OWRT C-4123(No. 9023)(5).

Descriptors: *Water resources, *Flow, *Sewage disposal, *Simulation analysis, *Optimization, Combined sewers, Detention reservoirs, Drainage, *Water pollution control, Storms, Rainfall, Runoff, Mathematical models, Systems analysis, Automatic control, Waste water(Pollution), Management, California.
Identifiers: *Control strategies, San Francisco(Cal), Vicente Subbasin.

Simulation and optimization techniques were employed in developing strategies for the operation of detention reservoirs for the control of combined sewer overflows. A single subbasin reservoir system in the San Francisco Plan for Wastewater Management was used as a case study. A relatively simple quantity simulation model was constructed and used in conjunction with both artificial and long-term historical rainfall data to develop and evaluate various general control strategies. The emphasis was on off-line simulation and optimization leading to development of operating rules that require only predictions of storm depth and effective duration of real-time use. It was concluded that substantial improvement in system performance can be achieved by utilizing some type of control strategy over a no control policy. Reduction in average overflow volume per year of up to 38% and in overflow events per year of over 43% were achieved. (Bell-Cornell)
W76-07236

WASTEWATER REUSE BY CONTINUOUS ION EXCHANGE,
Avco Systems Div., Wilmington, Mass.
H. Gold, and A. Todisco.
In: Complete WateReuse: Industry's Opportunity, April 23-27, 1973, American Institute of Chemical Engineers and Environmental Protection Agency--Technology Transfer, p 96-103. 3 fig, 1 tab, 13 ref.

Descriptors: *Waste water treatment, *Water reuse, *Ion exchange, *Water treatment, Economics, Resins, Cost comparisons, Industrial wastes, Recycling.
Identifiers: Continuous moving bed, Regeneration, Continuous ion exchange.

Ion exchange has been used in industry for many years in the recovery of valuable substances from industrial liquids and the purification of these liquids for their reuse. It is the treatment of water with solid adsorbants. The economic limitation on this process comes from the expensive regenerant that must be used in order to obtain the original ion

exchange resin again. Difficulties arise because in many cases, substances that are to be removed are in low concentrations. Most of the ion exchange units presently in use are of the conventional downflow fixed bed, batch operated type. The Avco continuous moving bed process is described. This design consists of a moving bed in which the resin is kept continually moving through the column. The ion exchange, regeneration and wash operations occur simultaneously in the same column. Some operating problems resulting in higher maintenance costs have been experienced in continuous bed systems, but these must be weighed against the cost advantages resulting from higher regeneration efficiencies and lower waste stream volume. Principles of operation of this system are illustrated for water softening. Tests were carried out to evaluate the performance of this system. The most critical problem was the propulsion of the resin bed in a steady plug flow against the effects of bridging and pulsing. Hydraulic and mechanical properties of the moving packed bed system and the effects of compaction on permeability of the resin bed were investigated. (See also W76-05314) (Pinto-FIRL)
W76-07239

THE MEANING OF ULTIMATE DISPOSAL,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5E.
W76-07240

OVERVIEW OF SLUDGE HANDLING AND DISPOSAL,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5E.
W76-07241

THICKENING CHARACTERISTICS OF ALUMINUM AND IRON PRIMARY SEWAGE SLUDGES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5E.
W76-07243

FUTURE PROBLEMS IN SLUDGE PRODUCTION AND HANDLING SYSTEMS,
For primary bibliographic entry see Field 5E.
W76-07244

THE HELICAL BEND COMBINED SEWER OVERFLOW REGULATOR,
American Public Works Association, Chicago, Ill.
R. H. Sullivan, R. R. Boericke, M. M. Cohn, G. Galina, and C. Koch.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 619, $6.00 in paper copy, $2.25 in microfiche. Report EPA-600/2-75-062, December 1975. 124 p, 92 fig, 11 tab, 31 ref, 3 append. ROAP 21 ASY; Task 107, 1BB034, 68-03-0272.

Descriptors: Combined sewers, Design, Overflows, *Waste water treatment, *Storm drains.
Identifiers: Combined sewer overflow, *Combined sewer regulators, *Helical flow, Secondary motion, Combined sewer overflow treatment.

A design procedure and method to calculate settleable solids retention efficiency has been prepared for a combined sewer overflow regulator, using the principle of developing helical flow in an enlarged, curved extension of a sewer. A curved side overflow weir is used to draw off the clarified combined sewer overflow. Hydraulic and mathematical model studies were used in developing the helical flow concept and the design procedure. The reports of each model study are included. The helical bend principle was originally investigated by Dr. Prus-Chacinski of London, England. A second generation regulator was constructed in 1971 in Nantwich, England. The present study modified the design to conform to American wastewater conditions and practices. The helical bend combined sewer overflow regulator is capable of higher removal efficiencies with less hydraulic head loss than the swirl concentrator regulator, although the overall length of the helical unit appears to make it more expensive than the swirl concentrator. The helical bend regulator requires the use of only a mechanical outlet gate and cleaning facilities; otherwise it is essentially non-mechanical. (EPA)
W76-07246

WATER TREATMENT IN SQUID PROCESSING WASTES: I. WASTE WATER QUALITY, (IN JAPANESE),
Hokkaido Univ., Sapporo (Japan).
For primary bibliographic entry see Field 5A.
W76-07266

WATKINS V COBB COUNTY COMMISSION (NO LIABILITY FOR PERFORMANCE OF GOVERNMENT FUNCTION SUCH AS CONSTRUCTION, INSTALLATION AND MAINTENANCE OF SEWER-DRAINAGE SYSTEM),
For primary bibliographic entry see Field 6E.
W76-07385

HEAT EXCHANGERS AND EVAPORATORS,
Austral-Erwin Engineering Co., Houston, Tex. (Assignee).
For primary bibliographic entry see Field 3A.
W76-07433

SLUDGE DEWATERING,
C. H. Cox.
U.S. Patent No. 3,938,434, 14 p, 37 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 943, No 3, p 1137, February 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Sludge treatment, *Sludge disposal, Water pollution treatment, Water pollution control, Filtration, *Dewatering, Separation techniques, Filters.
Identifiers: Vacuum filters.

Filtration and dewatering of sludge and other slurry is carried out with an apparatus employing continuous filter-dewatering-expression under vacuum-compression. The apparatus consists of a flow-impeding structure and a combination sludge compression and dewatered solids discharge screw conveyor. The flow-impeding structure consists of an initial cylindrical portion, a following frustoconical portion, and a terminal cylindrical portion and is the filter-dewatering medium. It is formed of either a series of hoops or rings separated and closely spaced, held rigid by a frame; a continuous wire, semicircular in cross section, closely wound into a coil, held rigid by a frame; or a perforated screen held rigid by a frame. The rotating helical blades of the screw conveyor compress and squeeze liquid from the sludge within the structure through which the liquid escapes, and the screw conveyor discharges the dewatered solids out the end. An imperforate filtrate or liquid collection housing surrounds the structure, and a vacuum pump is connected to the filtrate housing. A coil-spring wiping or cleaning blade is positioned on the outside edge of the screw conveyor helical blade to provide continuous contact between the wiping or cleaning blade and the inside surface of the filtering-dewatering medium. A series of cleaning nozzles that project out radially from the outer edge of the helical blades are spaced to discharge, under pressure, a forceful blast of air, steam or water to dislodge material and keep the filter-dewatering medium clean and open. (Sinha-OEIS)
W76-07434

SEWAGE TREATMENT PROCESS,
W. J. Bauer.
U.S. Patent No. 3,939,066, 4 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 943, No 3, p 1342-1343, February 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Water purification, Pressure, Mixing, Turbulence, Biological treatment, Activated sludge, Suspended solids.

Sewage is caused to flow through a hydraulic system which subjects the sewage to a sudden substantial drop in pressure, along with an attendant increase in velocity, and violent turbulence or agitation. The pressure may be decreased on the order of 20 psi in 1/10 second or less, and the sewage may be subjected to turbulent flow while under a vacuum. The resulting material evidences a marked increase in the amount of suspended solids. The sudden pressure drop and violent turbulence causes comminution of the solids particles into many smaller particles and thorough mixing, resulting in homogenization of the particles in the sewage. The resultant sewage material then may be subjected to bacterial adsorption and ingestion, or biological treatment. The production of many smaller particles results in a greatly increased total surface area of solids particles for exposure to the action of natural bacteria. The bacteria and associated adsorbed particles are then settled or otherwise separated from the remainder of the sewage mixture and removed as sewage sludge. The remaining effluent has a greatly reduced quantity of organic waste materials in it. The sludge may be kept in an aerobic condition by addition or air or oxygen so that the metabolism of the bacteria and the associated consumption of the attached organic wastes by these bacteria will proceed at a rapid rate. A portion of this sludge may be recycled back into the system. (Sinha-OEIS)
W76-07435

METHOD AND APPARATUS FOR TREATING SEWAGE,
Gypsum Industries Ltd., Transvaal (South Africa). (Assignee).
P. H. Huisman.
U.S. Patent No. 3,939,067, 3 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 943, No 3, p 1343, February 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Water pollution control, Water quality control, *Activated sludge, Aeration, Recycling, Denitrification, Application equipment.

A method of treating sewage uses the activated sludge process. Sewage is introduced into a circular aeration chamber. A spiral motion about the chamber center causes liquid-borne sludge from the chamber to flow along a canal around the chamber and returns at least part of the liquid-borne sludge in the canal back into the aeration chamber under the influence of gravity for recirculation. Apparatus suitable for use in this treatment comprises a tank having a central aeration chamber and a canal around it, an overflow weir from the chamber into the canal, a deflecting wall in the canal co-operating with an underflow weir from the canal to the chamber and an outlet from the canal adjacent the deflecting wall upstream. Further features provide for the overflow and underflow weirs to be located adjacent one another, for the floor of the canal to slope downward from the deflecting wall to the underflow weir, for the deflecting wall to be displaced progressively towards the aeration chamber center over the length of the canal having the inclined bottom, and for the aeration chamber to have a base in the form of an endless channel of arcuate cross-section. (Sinha-OEIS)

W76-07436

METHOD AND INSTALLATION FOR THE TREATMENT OF WASTE WATER TO FORM USEFUL WATER,
Schweizerische Luftverkehr A.G., Zurich (Switzerland).
H. Roth.
U.S. Patent No. 3,939,070, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 943, No 3, p 1344, February 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water purification, *Water pollution treatment, Water quality control, Flocculation, Chemical reactions, Reverse osmosis, Filtration, Potable water, Separation techniques, Membrane processes, Flotation.
Identifiers: Electro-flotation.

A method is provided for treating waste water which is accumulated due to industrial operations which also contains sludge and emulsified constituents, so as to form useful or consumable water. First a flocculation treatment is carried out in which there is added to the buffered waste water a flocculation agent or flocculant, preferably metallic salts, such as iron chloride, iron sulfate or aluminum sulfate, which throughout certain pH-ranges form flaky or flocculent precipitants. The separation of the suspended substances or particles can occur in conventional manner by electro-flotation, if necessary with the aid of collectors or accumulators and foamers. There is thus employed electro-flotation wherein the gas bubbles are produced at the turbid portions of the waste water by electrolysis. Then the clarified water from the flotation process is delivered through the agency of a safety filter directly to the reverse osmosis filtration. It is preferable that the clarified water which is further purified by reverse osmosis, be purified through the use of wound cellulose acetate modules arranged in pressure pipes or tubes. (Sinha-OEIS)
W76-07438

APPARATUS FOR GENERATING AN OXIDIZING REAGENT FOR THE TREATMENT OF POLLUTED WATER,
Air Liquide Societe Anonyme pour et l'Exploitation des Procedes, Paris (France). (Assignee).
E. J. LaForte.
U.S. Patent No. 3,939,072, 4 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 943, No 3, p 1344, February 17, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, *Waste water treatment, *Water pollution treatment, Water pollution control, Water quality control, Disinfection, Environmental sanitation, Oxidation, Chemical reactions.
Identifiers: Monoperoxysulphuric acid.

A process and apparatus for generating an oxidizing reagent for the treatment of polluted water is described. The monoperoxysulphuric anion is used for detoxification by oxidation of impurities contained in industrial waste water or for disinfection of water in reservoirs etc. However the monoperoxysulphuric anion found in relatively stable forms also have secondary pollution effects such as those caused by the NH4+ ion. The apparatus of this invention generates monoperoxysulphuric acid from hydrogen peroxide and sulphuric acid and is instantaneous at the moment of use before decomposition in a quantity just sufficient to achieve the desired effect and which permits the medium to be treated to be kept at a suitable pH value in order that the treatment be carried out. Hydrogen peroxide in the form of an aqueous solution with a concentration ranging from 35 to 100 percent and either concentrated sulphuric acid or fuming sulphuric acid are added simultaneously in a reaction vessel. The temperature of the reaction is maintained in the range -10 deg C to +80 deg C and the supply of the hydrogen peroxide and sulphuric acid to the reaction vessel is controlled so that the generation of the monoperoxysulphuric acid occurs when required and the quantity produced is adjusted according to the quantity required for the reaction. (Sinha-OEIS)
W76-07439

APPARATUS FOR CONTROL OF A REVERSE OSMOSIS SYSTEM,
Desalination Systems, Inc., Escondido, Calif. (Assignee).
For primary bibliographic entry see Field 3A.
W76-07440

TREATING WASTE WATER CONTAINING NITRILES AND CYANIDES,
Sumitomo Heavy Industries, Ltd., Tokyo (Japan). (Assignee).
A. Kato, and K. Yamamura.
U.S. Patent No. 3,940,332, 4 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 943, No 4, p 1808, February 24, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution control, Water quality control, Water pollution treatment, *Activated sludge, Water purification, Microbial degradation, Microorganisms, Nitrogen compounds.
Identifiers: Nocardia, *Cyanides, *Nitriles.

A waste water effluent containing nitriles and cyanides is treated by passing through an acclimated, activated sludge containing a microorganism capable of degrading nitriles and cyanides. The microorganism is selected from the genus Nocardia. The strain Nocardia rubropertincta (ATCC 21930) acts to purify the waste water effluent. The waste water effluent containing 50 ppm to 250 ppm of nitriles and 10 to 50 ppm of cyanide and 500 to 2,000 ppm of COD (Potassium Dichromate Method) can be purified with a high efficiency. (Sinha-OEIS)
W76-07443

PROCESS FOR PHYSICALLY AND BIOLOGICALLY PURIFYING SEWAGE,
A. Schreiber, B. Schreiber, and E. Schreiber.
U.S. Patent No. 3,940,333, 6 p, 4 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 943, No 4, p 1808-1809, February 24, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, Water quality control, Water pollution treatment, *Filtration, Water purification, *Biological treatment, Trickling filters, Aeration, Microorganisms.
Identifiers: Biofilters.

A process for physically and biologically purifying sewage uses a combination filter-biofilter containing a bed of artificially aerated filler material. The sewage is preliminarily clarified and distributed evenly over the filler material and is caused to flow through it for a limited time until the sewage has coated the surfaces of the filler material with sludge and microorganisms to an extent that the passage of air through the filler bed is substantially decreased because of encrustation of the interstices of the filler material. At this point the flow of sewage through the filler material is halted and the bulk of the sludge is removed by turning the filler material over with air. Then, the flow of sewage through the filler material is reinstituted. An abrasion resistent filler material is used and for purposes of turning-over the filler material, the bed is filled with water and the water and the filler material are turned over within the filter-biofilter by means of blown-in compressed air. At the same time the released sludge is drawn off. The turning-over of the filler material and water are accomplished gradually in a horizontal direction through the contents of the filter-biofilter. (Sinha-OEIS)
W76-07444

METHOD FOR SEPARATING OIL FROM WATER,
Kababa Industry Co. Ltd., Tokyo (Japan); and Mitsubishi Industries Ltd., Tokyo (Japan); and Chemical (E. C.) Industries Co. Ltd., Osaka (Japan).
T. Miyazawa.
U.S. Patent No. 3,940,334, 5 p, 1 fig, 2 tab, 10 ref; Official Gazette of the United States Patent Office, Vol 943, No 4, p 1809, February 24, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water purification, *Water pollution control, Water quality control, Water pollution treatment, *Separation techniques, *Oil wastes, Lipids, Organic compounds, Solvents, Coagulation, Skimming, Water reuse.
Identifiers: Paraffinic hydrocarbons.

A highly efficient process for the separation of oil from water in waste water treatment is provided. Paraffinic hydrocarbons with a specific gravity of less than 0.8 are added as extractive solvents to waste water containing fats and oils, together with inorganic or organic coagulants. This mixture is then stirred and allowed to stand; the floating oil-containing scum is then removed so as to eliminate the fats and oils from the waste water, and the resulting treated water may be re-used as process water in the plant or discharged into rivers or sewage lines. The oil-containing scum removed from the waste water is distilled so as to separate the paraffinic hydrocarbons, namely the fats and oils extraction solvents, from the mixture. The distillation vapor is then condensed to recover the paraffinic hydrocarbons and the remaining residue is, after filtration, incinerated or discarded. (Sinha-OEIS)
W76-07445

HORIZONTAL FLOW CLARIFIER,
Ecodyne Corp., Lincolnshire, Ill. (Assignee).
H. D. Robinson.
U.S. Patent No. 3,940,337, 4 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 943, No 4, p 1809-1810, February 24, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water purification, Water pollution control, Water quality control, *Water pollution treatment, Settling basins, Separation techniques, Suspended solids, Flow separation.
Identifiers: *Clarifiers.

A clarifier purifies liquids containing solids or contaminants. The liquid enters the clarifier and is directed into a primary sludge contact zone where it is mixed with recirculating sludge. Liquid from the primary sludge contact zone is pumped via flumes to the entrance of a settling corridor for horizontal flow. The liquid flows through the corridor forming an upper free-fall zone and a lower sludge zone as the precipitates settle out. As the liquid reaches the settling corridor exit, it approaches a point of positive separation of the clarified liquid above from the sludge stream below, which is formed by the kinetic capture of precipitates settling from the free-fall zone into the sludge zone of increasing velocity. The clarified liquid and the sludge stream enter a separation zone where they are caused to contact a vertical flow directing partition wall causing the sludge stream, of higher velocity, to pass under back into the primary contact zone and the clarified liquid, of lower velocity, to pass over to be boosted through flumes into a secondary settling basin for polishing. Polished liquid then flows over weirs to the outlet while the sludge collected in the basin is directed to the entrance of the settling corridor. (Sinha-OEIS)
W76-07447

5E. Ultimate Disposal Of Wastes

POULTRY PROCESSING PLANT WASTE-WATER DISPOSAL ON SOD,
Maryland Univ., College Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W76-06811

ENGINEERING, ENVIRONMENTAL AND ECONOMIC PLANNING FOR COAL REFUSE DISPOSAL,
D'Appolonia (E.) Consulting Engineers, Inc., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W76-06947

SANITARY-HELMINTHOLOGIC ASSESSMENT OF IRRIGATION WITH SEWAGE BY MEANS OF SPRINKLING, (IN RUSSIAN),
N. I. Khizhnyak.
Gig Sanit 38(3), p 104-105, 1973.

Descriptors: Irrigation, *Sewage disposal, *Waste disposal, Crops, *Waste water disposal, Public health.
Identifiers: *Helminthologic assessments, Mangel-wurzel.

Sanitary-helminthological assessment of irrigation with sewage was studied in experimental portions of 4 collective farms. Cucumbers, tomatoes, cabbage, mangel-wurzel and perennial grasses were cultivated. After irrigation, 10-30 helminth eggs/kg were found in surface soil of 1 collective farm; 5-12/kg at a depth of 10 cm and 0-8 at a depth of 20 cm. Cucumbers from that farm contained up to 4-5 helminth eggs/kg; tomatoes, 1-2 and cabbage, 2-3. Cultivation of cabbage in irrigated fields should be prohibited. Annual and perennial grasses, grains and fodder may be grown safely. Only completely dehelminthized sewage should be used in watering of crops by the sprinkling method.--Copyright 1975, Biological Abstracts, Inc.
W76-06983

PORTOBELLO LONG SEA SEWAGE OUTFALL TUNNEL,
Tunnels and Tunnelling, Vol. 7, No. 6, p 23-24, November/December, 1975.

Descriptors: *Sewers, *Tunnels, *Tunneling, *Outfalls, Construction, Sewage disposal, Grouting.
Identifiers: *Chalk.

Problems in the construction of a sea sewage outfall tunnel beneath the English Channel at Portobello have been caused by the upper chalk material in the path of the tunnel. Chalk has been encountered in three different conditions: highly fissured chalk underneath the foreshore, where fissures were either open and water bearing or full of soft putty chalk; good sound material with open fissures; or (presently encountered) highly fractured chalk with putty and virtually no strength. Due to the low strength of the chalk, stronger linings with bolt cast iron lining rings were required. In the final section of the tunnel, to be completed in 1976, driving must be preceded by extensive ground treatment. It was found that the critical factor in ground treatment is the interval at which probes are drilled.In highly fissured material an alternating pattern of four probes drilled to a 13 m length every 3 m of tunnel advance was necessary. It was also determined that several fissures could be grouted simultaneously through the same hole. Rapid hardening grout was used to reduce delay times. (Kramer-FIRL)
W76-06986

INCINERATOR AND SYSTEM FOR CLEANING PRODUCTS OF COMBUSTION,
K. D. Brown.
United States Patent 3,911,836. Issued October 14, 1975. Official Gazette of the United States Patent Office, Vol. 939, No. 2, p 677, October, 1975.

Descriptors: *Incineration, *Waste disposal, *Sewage treatment, *Cleaning, *Patents, Equipment, Pumps, Burning.

An incinerator and combustion product cleaning system for burning sewage has been patented. A preheating chamber heats and partially dries the moist waste to be burned. Waste is supplied to the preheating chamber and passes by a conveyor to a combustion chamber. Blowers supply air to the combustion chamber. A liquid vortex type vacuum pump is used to withdraw gaseous matter from both chambers and to clean the withdrawn gas. (Kramer-FIRL)
W76-06991

IMPROVING QUALITY OF LEACHATE FROM SANITARY LANDFILLS.
French Patent FR 2256-114. Issued August 29, 1975. Derwent French Patents Abstracts, Vol. W, No. 42, p D3, November, 1975.

Descriptors: *Patents, *Water quality control, *Leachate, *Landfills, Waste disposal, Cements, Metals.

A patent has been issued for a process for improving quality of leachates from sanitary landfills. Waste material is treated by mixing it with an aqueous solution of an alkali metal silicate and silicate settling agent containing polyvalent metal ions. This converts the mixture into a consolidated, chemically and physically stable earth-like material, substantially insoluble in water. Its pollutants are entrapped in the soldified silicate. The landfill material and treated waste material are disposed of in contact with each other so that the leachate will trickle down through the treated waste material. A frequently used setting agent is Portland cement. (Kramer-FIRL)
W76-06992

LAND AND SEA SOLIDS MANAGEMENT ALTERNATIVES IN PHILADELPHIA,
Philadelphia Water Dept. Pa.
C. F. Guarino, M. D. Nelson, S. A. Townsend, T. E. Wilson, and E. F. Ballotti.
Journal Water Pollution Control Federation, Vol. 47, No. 11, p 2551-2564, November, 1975. 7 fig, 9 tab.

Descriptors: *Waste disposal, *Sludge disposal, *Waste water treatment, Pennsylvania, Costs, Oceans, Delaware River, Irrigation, Environmental effects, Solid wastes, Ultimate disposal.
Identifiers: *Land application, Ocean dispersal.

A study was performed for the city of Philadelphia, Pennsylvania, comparing land application with ocean disposal of waste water solids. Since May 1973, Philadelphia has disposed of its digested sludge at a sea dispersal site 50 nautical miles from the mouth of the Delaware River. The city's three waste water treatment facilities handle a total of 447 mgd. Alternatives for solids disposal were detailed. Sea disposal methods included: dispersing thickened digested solids 11.5 nautical miles from Cape May, New Jersey (practiced from May 1961 unti May 1973 when the EPA moved the site); dispersing unthickened digested solids at that location; or dispersing unthickened digested solids at a point 50 nautical miles from Cape May. Land application alternatives were: dispersing liquid sludge by sprinkler irrigation, plow-in technique or tanker application; dispersing sludge cake by trenching, land filling or spreading and incorporating; or by composting. After considerations of costs, environmental effects, and operational simplicity, it was concluded that ocean dispersal should be continued for solids management in Philadelphia. (Kramer-FIRL)
W76-07033

BROOKHAVEN'S TWO SEWAGE TREATMENT PLANTS,
Brookhaven National Lab., Upton, N. Y.
For primary bibliographic entry see Field 5D.
W76-07044

SEWERAGE AND SEWAGE DISPOSAL,
I. D. Kirkaldy.
Chartered Municipal Engineer, Vol. 102, No. 11, p 219-221, November, 1975.

Descriptors: *Sewerage, *Sewage disposal, *Sewage, *Disposal, *Waste water disposal, History, Treatment facilities, Financing, Automation, *Waste water treatment.
Identifiers: Water authorities, Great Britain, South Hampshire(Great Britain).

A historical review of sewerage and sewage disposal is presented. Legislation governing the disposal of wastes to rivers near cities has been passed since the fourteenth century in Britain. Commissions appointed in the last century to study river pollution came out in favor of land disposal or irrigation as a possible use of wastes. Prior to the recent reorganization, sewerage and sewage disposal was administered by almost 1400 authorities. Even after reorganization, a split existed between sewerage and sewage disposal. Confusion has been caused by the difference in the methods of finance brought about by reorganization. Water authorities are also experiencing difficulties in obtaining realistic figures from local authorities on current schemes. There is much speculation on the continuing role of district councils as agents for the water authority in sewerage matters. Advantages of the reorganization can not be determined in the short term. Time and effort is involved but eventually a more rational system will evolve. The aim should be the consideration of regionalization of treatment facilities where possible. Proposals for the South Hampshire main drainage project are considered in this light. The final scheme was adopted after much investigation and deliberation. For new disposal works, the cost of automation should be weighed against the rise in labor costs. Precise knowledge of all of the interrelations of parameters in sewage treatment processes is lacking, and complete automation should be avoided. Sludge incineration and dewatering systems on the continent should be investigated. (Pinto-FIRL)
W76-07046

UPGRADING LAGOON TREATMENT WITH LAND APPLICATION,
Robert S. Kerr Environmental Research Lab., Ada, Okla. Water Quality Control Branch.
For primary bibliographic entry see Field 5D.
W76-07054

THE INFLUENCE OF IRRIGATION BY MEANS OF DAIRY PLANT SEWAGE POURED OUT OF SPRINKLING PIPES ON THE YIELDS OF SOME PLANTS CULTIVATED ON SANDY SOIL AT LASKOWICE OLAWSKIE, (IN POLISH),
Instytyt Uprawy Nowozenia i Gleboznawstwa, Pulawy (Poland).
For primary bibliographic entry see Field 5D.
W76-07110

MANAGING LIVESTOCK WASTES.
American Society of Agricultural Engineers, St. Joseph, Mich.
For primary bibliographic entry see Field 5D.
W76-07154

TECHNIQUES THAT ARE SOLVING POLLUTION PROBLEMS FOR POULTRYMEN,
New York State Coll. of Agriculture and Life Sciences, Ithaca.
For primary bibliographic entry see Field 5D.
W76-07166

CONTROL, COLLECTION, AND DISPOSAL OF FEEDLOT RUNOFF,
Nebraska Univ. Lincoln.
For primary bibliographic entry see Field 5D.
W76-07167

MANAGEMENT OF RUNOFF WATER IN RELATION TO FEEDLOT OPERATIONS,
Soil Conservation Service Temple, Tex.
For primary bibliographic entry see Field 5D.
W76-07168

FEEDLOT WASTE RECYCLING WITH A FLUSH CLEANING SYSTEM,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-07170

A WASTE MANAGEMENT SYSTEM FOR A 150-COW DAIRY--A 10-YEAR CASE STUDY,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-07174

MANURE PONDS FOR MINIMIZING POLLUTION,
Soil Conservation Service, Kewaunee, Wis.
For primary bibliographic entry see Field 5D.
W76-07176

A TOTAL RECYCLE UNIT SYSTEM FOR DAIRY MANURE MANAGEMENT,
Purdue Univ. Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-07177

SWINE PRODUCTION AND WASTE MANAGEMENT: STATE-OF-THE-ART,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-07178

SWINE WASTE NUTRIENT RECOVERY SYSTEM BASED ON THE USE OF THERMAL DISCHARGES,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-07179

MANAGING A SUCCESSFUL LIQUID SWINE MANURE MANAGEMENT SYSTEM,
Leanco Corp., Brownwood, Tex.
For primary bibliographic entry see Field 5D.
W76-07180

TOTAL WASTE MANAGEMENT FOR A LARGE SWINE PRODUCTION FACILITY,
For primary bibliographic entry see Field 5D.
W76-07181

DIRECT LAND DISPOSAL OF FEEDLOT RUNOFF,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5D.
W76-07183

DISPOSAL OF BEEF FEEDLOT WASTES ONTO LAND,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-07184

EFFECTIVENESS OF FOREST BUFFER STRIPS IN IMPROVING THE WATER QUALITY OF MANURE POLLUTED RUNOFF,
Maryland Univ., College Par., Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-07189

OPTIMUM DILUTION OF SWINE WASTES FOR GROWTH OF LEMNA MINOR L. AND EUGLENA SP,
Tennessee Valley Authority, Muscle Shoals, Ala. Environmental Biology Branch.
For primary bibliographic entry see Field 5D.
W76-07191

MANAGEMENT OF IRRIGATION FOR DISPOSAL OF FEEDLOT RUNOFF IN COLD CLIMATES,
North Dakota State Univ., Fargo.
For primary bibliographic entry see Field 5D.
W76-07194

PRESENT KNOWLEDGE ON THE EFFECTS OF LAND APPLICATION OF ANIMAL WASTE,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W76-07199

ON-THE-FARM DETERMINATION OF ANIMAL WASTE DISPOSAL RATES FOR CROP PRODUCTION,
Washington State Univ., Pullman. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W76-07200

DISPOSAL OF DAIRY CATTLE MANURE ON SOIL,
Agricultural Research Service, Auburn, Ala.
For primary bibliographic entry see Field 5D.
W76-07201

POLLUTION ABATEMENT OF POULTRY MANURE BY MAXI-MIXING METHOD,
Connecticut Univ., Storrs. Dept. of Animal Science.
For primary bibliographic entry see Field 5D.
W76-07202

ON LAND DISPOSAL OF LIQUID ORGANIC WASTES THROUGH CONTINUOUS SUBSURFACE INJECTION,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-07203

DIFFUSION AND MIGRATION OF POLLUTED WATER ALONG THE BELGIAN BEACHES. NEW EXPERIMENT INVOLVING DUMPING OF 100 KG RHODAMINE B: PRELIMINARY CONCLUSIONS, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Ostend. Laboratoire de Bacteriologie.
For primary bibliographic entry see Field 5B.
W76-07207

STATISTICAL DESIGN BASIS FOR SUBMERGED DIFFUSER,
Quirk, Lawler and Matusky, New York.
For primary bibliographic entry see Field 5B.
W76-07214

THE MEANING OF ULTIMATE DISPOSAL,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. B. Dean.
In: Complete WateReuse: Industry's Opportunity, April 23-27, 1973, American Institute of Chemical Engineers and Environmental Protection Agency--Technology Transfer, p 135-139.

Descriptors: *Ultimate disposal, *Water reuse, *Water utilization, *Waste water disposal, *Waste disposal, Industrial wastes, Waste storage, Storage, Disposal, Costs.
Identifiers: Volume reduction.

The reuse and ultimate disposal of industrial waste waters are discussed. Industrial waste waters can be discharged after suitable purification; they can be evaporated; or they can be purified and reused. Reuse means eventually all dissolved or suspended materials must be accounted for. Those that can not be thrown away, given away, or sold must be stored somewhere. Careful housekeeping can eliminate some and reduce many other wastes. Wastes that are necessary by-products will accumulate in quantities that cannot be further reduced by any waste control program. Removing water minimizes the volume of the waste to be stored, but the cost of drying must be balanced against the reduced cost of storage. Wastes can be converted to useful products only if the cost of conversion can be justified by the market value of the products. Careful segregation of waste streams can reduce the cost of treatment and disposal substantially, and may permit profitable recovery of some of the toxic wastes. (See also W76-05314) (Pinto-FIRL)
W76-07240

OVERVIEW OF SLUDGE HANDLING AND DISPOSAL,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. B. Farrell.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 1-22. 3 fig. 3 tab, 10 ref.

Descriptors: *Sludge, *Sludge disposal, Waste water treatment, Dewatering, Municipal wastes, Filtration, Centrifugation, Heat treatment, Ultimate disposal, Oceans, Landfill, Incineration, Stabilization, Waste treatment.
Identifiers: Sludge conditioning, Ocean disposal, Co-incineration, Co-pyrolysis, Filter cake, Gravity thickening, Air flotation.

An overview of the sludge handling and disposal research performed by the Ultimate Disposal Section of the U.S. Environmental Protection Agency's National Environmental Research Center in Cincinnati, Ohio, is presented. An objective of this group has been to advance the technology for processing and disposing of the concentrates from municipal and advanced waste water treatment processes. Recent developments in treatment and disposal operations are considered. Before dewatering, sludges must be thickened as much as possible. Gravity and air flotation thickeners are most commonly used. Recent developments in stabilization processes include anaerobic or aerobic thermophilic digestion. These processes combine stabilization and pasteurization into one step and cost reductions can result. Filtration and centrifugation are the most commonly used methods of dewatering. Newer methods include filter presses, vertical presses and belt filters. These methods are good for making high cake solids. Before filtering, sludges must be conditioned. The most effective means besides additives is heat treatment. Sludge disposal is becoming the largest problem in waste

over processing. Conventional methods include ocean disposal, landspreading, landfill and incineration. Ocean disposal and incineration do not face promising futures because of the other types of pollution they can cause; land application and landfill are subject to guidelines and available sites. Promising areas for the future include co-incineration and co-pyrolysis of sludge with solid waste. (See also W76-05079) (Pinto-FIRL)
W76-07241

THERMAL DEGRADATION OF SLUDGES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. A. Olexsey.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 127-196. 16 fig, 8 tab, 69 ref.

Descriptors: *Heat, *Degradation(Decomposition), *Sludge treatment, *Sewage sludge, Sludge disposal, Incineration, Organic matter, Ultimate disposal, Economics, United States, Waste treatment.
Identifiers: Land disposal, On-site disposal, Pyrolysis, Multiple hearth, Thermal processing, Fluidized bed, Wet oxidation.

Although land disposal of sewage sludge remains the most common method of application, there are increasing pressures to employ on-site reduction and disposal methods. Alternate techniques in the form of thermal processing or thermal degradation are discussed. Analysis of some sludge properties shows that sludge is mostly water, is inclined to retain the water, is difficult to handle and odorous, has 30% nonvolatile materials or solids, and is corrosive to equipment. Incineration, despite its drawbacks, is the most attractive alternative. Different types of incinerators are discussed. The multiple hearth sludge incinerator is the most popular in the United States. In the three operating zones the sludge is dried, burned and then cooled. Volume reduction in the 90% range is typical. The fluidized bed is the second most popular method in the United States. A bed of inert materials capable of oxidizing organic solids is used in this design. This method is simple to operate. Other less widely applied methods of incineration include the flash drier-incinerator, the rotary kiln, and the cyclone furnace. Three commodities go into a sludge disposal system: money, sludge and fuel. Two main products are ash and gas emissions. Incineration as compared to land application of sludge is costly, fuel consuming, and can contribute to air pollution. Other methods of on-site disposal are being investigated that will minimize these disadvantages, including pyrolysis, combined incineration with sludge waste, and wet oxidation. (See also W76-05079) (Pinto-FIRL)
W76-07242

THICKENING CHARACTERISTICS OF ALUMINUM AND IRON PRIMARY SEWAGE SLUDGES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
S. W. Hathaway, and J. B. Farrell.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 197-235. 6 fig, 10 tab, 7 ref.

Descriptors: *Sewage sludge, *Aluminum, *Iron, Salts, Chemical precipitation, Sludge, Phosphates, Filtration, Gravity, *Sludge treatment, Treatment facilities, Waste treatment, Economics, Dewatering, Equipment, Effluents, Polymers.
Identifiers: *Thickening characteristics, Primary sewage sludges, Phosphate removal, Gravity thickening, Air flotation, Thickening rates, Alum, Polymer conditioning.

Phosphate removal in sludge is usually accompanied by the precipitation of metallic salts such as aluminum and iron. Thickening characteristics of Al-primary and Fe-primary sludges by means of standard gravity thickening and air flotation measurements are defined. Since sludge characteristics change even within a certain treatment facility, duplicate treatment units were set up to standardize measurements. Sludges were treated with either alum or ferric chloride. These sludges were very homogeneous mixtures while the conventional primary sludge was fibrous and lumpy. Results showed that Al-primary and Fe-primary sludges do not gravity thicken as well as conventional primary sludges. They only thicken to about 4-5% solids. Dilution with effluent or polymer conditioning can greatly improve thickening rates. Air flotation has shown to be a satisfactory means of thickening Al and Fe-primary sludges but is not as effective with conventional primary sludge. Polymer addition improves performance. There is a need for a more comprehensive screening to uncover polymers that may produce higher solids contents at higher thickening rates. Al and Fe-primary sludges can be filtered at reasonable rates, as long as the solids content is above 4%. This solids content can be achieved by gravity or flotation thickening. Subsequent dewatering steps are thus practicable and capital costs for equipment are not excessive. (See also W76-05079) (Pinto-FIRL)
W76-07243

FUTURE PROBLEMS IN SLUDGE PRODUCTION AND HANDLING SYSTEMS,
J. V. Hunter.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 267-281. 11 ref.

Descriptors: *Sludge, *Waste water treatment, Sludge treatment, Lime, Salts, Iron, Aluminum, *Coagulation, Phosphates, Sludge digestion, Anaerobic digestion, Inorganic compounds, Alkalinity, *Chemical precipitation.
Identifiers: Ferric chloride, Alum, Phosphate removal, Sludge handling, Particulate matter.

Ferric salts, alum or lime can be used in waste water treatment in two ways: as a coagulant for the removal of particulate materials; or as a precipitant in phosphate removal processes. Inorganic compounds will result. Modifications and problems in present sludge treatment and handling processes that might be expected from their employment are indicated. The composition, production, water holding capacities, and digestion of the sludge and the regeneration and recovery of the precipitants and coagulants are studied. Results show that the total dry weight of the sludges increases with the use of alum, ferric chloride or lime as precipitants or coagulants. In the case of a lime sludge, there is no change of volume after addition of the coagulant or precipitant. The inorganic contents of these sludges are higher and the composition is fairly predictable from a knowledge of the reactions involved and the amounts of particulates and phosphates removed. Anaerobic digestion may be adversely affected but there are other treatment and disposal methods available so that this is not a significant disadvantage. Lime sludges and alum sludges can be reprocessed to recover the precipitants. Alkaline regeneration results in a low quality coagulant. (See also W76-05079) (Pinto-FIRL)
W76-07244

SLUDGE DEWATERING,
For primary bibliographic entry see Field 5D.
W76-07434

5F. Water Treatment and Quality Alteration

NEVADA WATER POLLUTION CONTROL REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-06838

NEBRASKA WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 5G.
W76-06840

SANITARY-HELMINTHOLOGIC ASSESSMENT OF IRRIGATION WITH SEWAGE BY MEANS OF SPRINKLING, (IN RUSSIAN),
For primary bibliographic entry see Field 5E.
W76-06983

BLOOMINGTON GOES SOLID-STATE,
Orr-Schelen-Mayeron and Associates, Minneapolis, Minn.
E. H. Anderson.
Water and Wastes Engineering, Vol. 12, No. 11, p 64-66, November, 1975. 2 fig.

Descriptors: *Automation, *Control systems, *Waste water treatment, *Sewers, *Water treatment, Computers, Treatment facilities, Construction, Equipment, Design criteria, Minnesota.

An automatic control system for the Bloomington, Minnesota, water treatment plant is described. Designed in 1972, the facility is equipped with a solid-state electronic control panel with three merchandized graphics to control storage reservoir levels, water distribution system pressures, remote pumping stations and local deep wells. In addition to these functions, the control system monitors the city's 16 sanitary sewers and 3 storm sewer lift stations. Warnings are provided for high wet and dry wells, power failures, transmission line failures, and vandalism. The facility is close to a residential area and noise levels outside the building have been kept quite low with the elimination of air compressors to produce carbon dioxide and with the installation of sound-absorbent materials around pumping areas. (Kramer-FIRL)
W76-06998

THROUGHFLOW MEASUREMENTS IN WATER AND WASTE WATER TECHNOLOGY (DURCHFLUSSMESSUNG IN DER WASSER- UND ABWASSERTECHNIK).
Wasser Luft und Betrieb, Vol. 19, No. 9, p 514-517, September, 1975. 10 fig.

Descriptors: *Instrumentation, *Measurement, *Flow, *Waste water treatment, *Water treatment, Equipment, Pressure, Pipelines, Venturi meters, Ultrasonics, Flowmeters, Flow measurements, Canals.

Methods and instruments used for flow measurement in open canals, and in nonpressure and pressure pipes are described. Venturi sections are commonly used for measurement in open canals and in nonpressure lines; other methods and instruments are also available for measurement in pressure lines. These include measuring orifices, venturi tubes, and devices adopting the principle of differential pressure measurement. Automatic counters permit the measurement of the instantaneous throughflow, the integration of the volume, and the transmission of the measurement values. Inductive flowmeters are suitable for measurement without pressure loss in media with a minimum conductivity of 0.05 microS/cm. Ultrasonic measurement is possible in existing pipelines with a minimum nominal diameter of 300 mm. (Takacs-FIRL)
W76-07004

VIRUSES IN WATER: THE PROBLEM, SOME SOLUTIONS,
Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5A.
W76-07006

STUDIES ON CHARACTERISTICS OF THE SURFACE WATER QUALITY IN KAMEDA DISTRICT,
For primary bibliographic entry see Field 5A.
W76-07007

CALCULATE CHEMICAL ADDITIVE FEED RATES IN THREE STEPS,
Interpace Corp., Rochester, N.Y. Pulsafeeder Products.
W. V. Dwyer.
Pollution Engineering, Vol. 7, No. 11, p 40, November, 1975. 1 fig.

Descriptors: *Waste treatment, *Water treatment, *Chemical reactions, *Graphical methods, Mathematical studies, Flow rates, Operations.
Identifiers: *Nomographs, Chemical additive feed rates.

A simple nomograph is presented for calculating chemical dosage rates for water and waste treatment plant operations. The formula for the precise calculation of chemical additive feed rate is flow (expressed in mgd) times dosage of treatment chemicals (in ppm) all divided by the feed concentration percent multiplied by the specific gravity of the chemical additive. This figure is then multiplied by a factor of 4.17. Because equipment operation rates are based on different factors than the flow rates for the overall treatment process, this calculation is time-consuming. An illustration of a nomograph which reduces this calculation to three steps to calculate the required feed rate in gallons per hour for a waste stream is provided. (Kramer-FIRL)
W76-07008

POLLUTION CONTROL PLANT STATISTICS.
For primary bibliographic entry see Field 5D.
W76-07009

FLUORIDATION ENGINEERING MANUAL,
Environmental Protection Agency, Washington, D. C. Div. of Water Supply.
E. Bellack.
Report EPA-520/9-74-022, 1974. 94 p, 19 fig, 6 tab, 55 ref, append.

Descriptors: *Water treatment, *Potable water, *Water works, *Fluoridation, Public health, Personnel, *Design criteria, *Treatment facilities, Equipment, Fluorides.

This manual on fluoridation engineering is designed to assist local and state engineers in designing fluoridation installations and water plant personnel in operating them. Emphasis is placed on the fact that the optimum concentrations have been determined by many studies involving millions of people, and should be adhered to. A deficiency of fluorine can lead to tooth decay, while an excess is the cause of dental fluorosis. The manual covers the following topics: compounds used in controlled fluoridation; feeders used for adding fluorides; preparation of fluoride solutions; selecting the optimal fluoridation system; control and surveillance; maintenance; safety and hazards in handling fluoride chemicals; and, technical problems attributed to fluoridation. No matter how well a fluoridation installation is designed, it is the water plant personnel who insure the successful operation. When planning a fluoridation installation, quantity of water pumped, economy, convenience, and location will affect the choise of chemical and equipment. (Orr-FIRL)
W76-07031

A MANUAL FOR THE EVALUATION OF A STATE DRINKING WATER SUPPLY PROGRAM,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
Report EPA-430/9-74-009, December, 1974. 49 p, 6 tab, 13 ref, 3 append.

Descriptors: *Water supply, *Water quality control, *Water sources, *Potable water, Public health, Standards, Monitoring.
Identifiers: Water supply program evaluation.

This manual was written to serve as a guide for EPA regional personnel in evaluating State water supply programs, as a guide for States in evaluating their own programs, and, to provide sufficient criteria, standards, and guidelines for the development of a model State water supply program that will effectively regulate and insure a healthful and safe supply of drinking water to the public. The first section of the manual discusses the three major divisions of authority under which a State water supply program normally operates. These include legal statutes, administrative rules and regulations, and water supply program policy. The second section lists the activities which are necessary for an effective regulatory and surveillance program. This section also presents guidelines for competent and efficient performance of these activities. The third section provides guidelines for the evaluation of a State's drinking water supplies and discusses criteria for selecting a representative number of public water supplies for study, current assessment of water supply systems based on a field survey of existing conditions and/or examination of pertinent data recorded in State, county, or water utility files, and important sanitary features of a water supply system and their health significance. (Orr-FIRL)
W76-07032

REMOVAL OF ORGANIC MATTER BY FLOC COLLOIDS ONTO SLUDGE PARTICLES,
Permutit-Boby Ltd., London (England).
A. I. Treanor.
Water Services, Vol. 79, No. 956, p 420-422, October, 1975. 4 fig.

Descriptors: *Organic matter, *Water treatment, *Flocculation, *Sludge, Salts, Natural streams, Fulvic acids, Humic acids, Chemical precipitation, Sludge treatment, Sedimentation, Filtration, Polyelectrolytes, Colloids, Coagulation, Zeta potential.
Identifiers: Permutit-Boby Precipitator, Floc colloids, Aging process, Mineral content.

Nearly all natural waters contain varying types and amounts of organic matter. Removal by the coagulation process depends on the nature of the organic substance, the mineral content of the water and the chemical characteristics of the coagulant. Organic substances found in water are either fulvic acid or humic acid materials. These generally have negative charges and in order for coagulation to take place, the charge must be reduced. This charge, or zeta potential, may be reduced by adding a mineral salt, such as aluminum sulfate, ferric sulfate, ferric chloride or chlorinated ferrous sulfate. After coagulation, flocculation, sedimentation or filtration may be necessary for removal of organic matter. Flocculation is accomplished by gentle agitation of the water so that the floc colloids can collide and aggregate into floc particles. There is a size limitation to this process, but after an aging process, causing contraction of the particles, increased densty and resistance to shear, they are considered as sludge particles and can combine with unaged floc colloids. They then can grow to a large enough size so that sedimentation or filtration can take place. In this process it is important that just the right amount of coagulant be added so that aging does not take place too quickly and the design of the clarifier must be such that sludge particles combine only with unaged floc colloids. A polyelectrolyte can be employed to increase settling rate and plant throughput. This is used in the Permutit-Boby Precipitator. This addition simplifies the flocculation stage and the aging process and segregates sludge growth from the coagulation process. (Pinto-FIRL)
W76-07034

TECHNIQUES FOR DISPERSING AND DISSOLVING OZONE IN WATER/PART I,
Compagnie Intercommunale Bruxelloise des Eaux (Belgium).
W. Massachelein, G. Fransolet, and J. Genot.
Water and Sewage Works, Vol. 122, No. 12, p 57-60, December, 1975. 5 fig, 4 tab.

Descriptors: *Water treatment, *Ozone, Kinetics, Disinfection, Aeration, Microorganisms, Performance, Dispersion.
Identifiers: Ozone residuals.

Selection of a contacting system for water injection of ozone was discussed. Experiments showed that treatment using circulating water was more efficient than a batch treatment technique. The rate of disinfection by ozone depends upon both the action of residual concentrations and on the action of contact between an 'ozone bubble' and the microorganisms. Both effects should influence the choise of system. Ozone-bubble contact should be promoted by appropriate mixing conditions while gas stripping is to be avoided during a sufficient period of quiescent action of residual ozone dissolved in the water. As Part I of a continuing article, this paper compared and evaluated several ozone-contacting systems, including hydrostatic injection with porous pipes, total injector, Vortex propeller, water recirculating propeller, air dispersing impeller, and liquid-circulating aeration impeller systems. (Kramer-FIRL)
W76-07035

SIMULATION OF LEAD REMOVAL BY CHEMICAL TREATMENT,
Knouse Foods Cooperative, Peach Glen, Pa.
L. M. Naylor, and R. R. Dague.
American Water Works Association Journal, Vol. 67, No. 10, p 560-565, October, 1975. 8 fig, 18 ref.

Descriptors: *Lead, *Model studies, *Lime, *Coagulation, *Water treatment, Surface waters, Analytical techniques, Alkalinity, Hydrogen ion concentration, Laboratory tests, Storm runoff.
Identifiers: *Chemical treatment.

Lead enters surface waters as a result of air scrubbing by rain and snowfall, from urban land runoff, from the exhaust of power boats, and from waste water effluents. In this study, the fate of lead in surface waters and the effectiveness of three water treatment processes in lead removal were considered. On a laboratory scale, alum coagulation, lime, and lime-soda ash softening were evaluated. The chemical softening process was evaluated with both conventional and solids-contact modes of operation. Results of the laboratory tests showed that the solids-contact method removed nearly all the lead over a wide range of contact solids concentrations. The conventional chemical softening is effective for lead removal in a pH range of of 9.2 to 10.4. Coagulation and flocculation with alum resulted in lead removal at pH levels of 8 to 9 but not near neutral values. The solubility of lead in surface waters is limited primarily by alkalinity and pH. (Kramer-FIRL)
W76-07041

THE PHYSICAL METHOD OF WATER STERILIZATION,
W. Summer.
Process Biochemistry, Vol. 10, No. 9, p 43-46, November, 1975. 3 fig, 6 tab.

Descriptors: *Water treatment, *Ozone, *Ultraviolet irradiation, Design criteria, Equip-

ment, *Waste water treatment, Water supply, Kinetics, Potable water.
Identifiers: Emergency water supplies.

Physical methods of water sterilization have been proposed to produce potable water supplies from heavily contaminated water, particularly in emergency situations. Two methods described were ultra-violet irradation and ozonation. The design of ultra-violet water treatment equipment was detailed. Ultra-violet energy at bactericidal wavelengths cannot achieve direct oxidation of organic contaminants suspended in a liquid. For this purpose, ozone is used effectively, rather than a chemical oxidant such as chlorine. If ozone is used as the oxidant in addition to uv sterilization, only small ozone quantities are required. The kinetics of ozone production for this purpose were outlined. The absorption of ozone in water as related to temperature and the usage of ozone as a bactericide in industrial water treatment were also discussed. (Kramer-FIRL)
W76-07043

SANITARY AND HYGIENIC CHARACTERISTICS OF WATER SUPPLY SOURCES OF THE POPULATION OF THE KUGART RIVER BASIN, (IN RUSSIAN),
Kirgiz Research Inst. of Epidemiology, Microbiology and Hygiene, Frunze (USSR).
B. A. Abylgaziev.
Gig Sanit 11, p 82-83, 1974.

Descriptors: *Bacteria, *Public health, *Water supply, Potable water, Epidemiology, River basins, Human population, Cities.
Identifiers: Kirgiz-SSR, *USSR(Kugart River Basin), Water.

The water of the Kugart River and wells, springs and water mains of the Suzak region and city of Kok-Yangaka in the Kirgiz SSR (USSR) does not always meet sanitary and hygienic requirements with respect to physiocochemical and especially bacteriological indices. This can have an effect on the epidemiological situation in populated areas.--Copyright 1975, Biological Abstracts, Inc.
W76-07047

THE INVESTIGATION OF ION REMOVAL FROM WATER AND WASTEWATER,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 5D.
W76-07060

EXTENDED PLAIN SEDIMENTATION,
West Pakistan Univ. of Engineering and Technology, Lahore.
For primary bibliographic entry see Field 5D.
W76-07204

WASTEWATER REUSE BY CONTINUOUS ION EXCHANGE,
Avco Systems Div., Wilmington, Mass.
For primary bibliographic entry see Field 5D.
W76-07239

DIRECT DETECTION OF PATHOGENS OF INTESTINAL INFECTIONS IN WATER, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 5A.
W76-07274

THE PRINCIPLES OF SUBSTANTIATING PERMISSIBLE CONCENTRATIONS OF RADIOACTIVE SUBSTANCES IN FRESHWATER BODIES, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W76-07275

METHOD AND INSTALLATION FOR THE TREATMENT OF WASTE WATER TO FORM USEFUL WATER,
Schweizerische Luftverkehr A.G., Zurich (Switzerland).
For primary bibliographic entry see Field 5D.
W76-07438

5G. Water Quality Control

MUNICIPAL WATERSHED MANAGEMENT SYMPOSIUM PROCEEDINGS.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 4D.
W76-06812

BOOKS ON WATER AND WASTEWATER.
National Center for Scientific and Technical Documentation, Brussels (Belgium).
For primary bibliographic entry see Field 10C.
W76-06816

NEPA AND THE CZMA: THE ENVIRONMENTAL IMPACT STATEMENT AND SECTION 306 GUIDELINES,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 6G.
W76-06817

ENVIRONMENTAL LAW- THE 1972 AMENDMENTS TO THE FEDERAL WATER POLLUTION CONTROL ACT EXTEND DREDGE AND FILL JURISDICTION ABOVE THE MEAN HIGH WATER LINE. UNITED STATES V. HOLLAND, 373 F. SUPP. 665 (MD FLA. 1974).
Rutgers-Camden Law Journal, Vol. 6, p. 823-41 (1975). 18 p.

Descriptors: *Federal Water Pollution Control Act, *Florida, *Water pollution control, *Navigable waters, *Non-navigable waters, Construction, Dikes, Navigation, Landfills, Pemits, Artificial watercourses, Discharge(Water), Conduits, Bayous, Fish, Wildlife, Recreation, High water mark, Wetlands, Judicial decisions.
Identifiers: *FWPCA Amendments of 1972, *Mean high water line, Tidal wetlands, Drainage ditches, Navigable servitude, Secondary discharge.

Until 1972 federal water pollution control had been limited to the regulation of activities affecting the nation's navigable waters. Then Congress amended the Water Pollution Control Act and redefined 'navigable waters' to mean 'waters of the United States.' In United States v. Holland, a district court held that the federal authority under the new definition extended to non-navigable waters and wetland areas above the mean high water line. In reaching its result the district court reviewed the legislative history to determine the extent of jurisdiction under the amendments, however, the court interpreted the policy of the amendments to be that 'the discharge of pollutants must be controlled at the source', and then applied a conduit theory to find the defendant landowner guilty of polluting Tampa Bay. The pollutant had been deposited in small canals, which then carried them into the bay. While the reasoning in Holland has been criticized for leaving many questions unanswered, the case will probably be cited for the propositions that navigability and the mean high water line no longer limit federal water pollution enforcement authority. (Segall-Florida)
W76-06820

STATE VIEWPOINT: (THE FEDERAL WATER POLLUTION CONTROL ACT AND THE STATES: LOVE IN BLOOM OR MARRIAGE ON THE ROCKS),
California State Water Resources Control Board, Sacramento.
R. B. Robie.
Natural Resources Lawyer, Vol. 7, p. 231-239 (1974), 9 p.

Descriptors: *Federal Water Pollution Control Act, *Water quality control, *Water pollution control, Legal aspects, Legislation, Federal government, Local governments, Governmental interrelations, Regulation, Permits, Water quality, Water pollution, Water pollution abatement, Water resources, Discharge(Water), Industries, Economics, Technology, Navigable waters, Industrial wastes.
Identifiers: *FWPCA Amendments of 1972, *National Pollution Discharge Elimination System.

Implementation of the Federal Water Pollution Control Act Amendments of 1972 will have adverse effects on State water pollution control efforts which may at least initially, outweigh the benefits to be gained by these amendments. The major benefit of the Amendments will be the uniform application of the law nationwide. This will eliminate threats by business to leave a state if the state attempts to enforce tough pollution control requirements. The Amendments allow states to operate the National Pollutant Discharge Elimination System (NPDES) under state law; however, a large amount of federal control is retained over these systems. States must go through a lengthy and complex bureaucratic process to obtain approval for their programs. Delays in approving these state programs will cause a problem in meeting the deadlines of the federal law and will also cause problems for waste dischargers who may become confused as to who is in charge of issuing permits. There are also problems with the technical standards of the Amendments in that they fail to vary treatment requirements for discharges to the ocean and discharges to fresh water. (Nursey-Florida)
W76-06824

CLASSICAL WRITERS OF INTERNATIONAL LAW AND THE ENVIRONMENT,
Montana Univ., Missoula. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W76-06825

THE ENVIRONMENT AND THE LAWYER,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-06826

ENVIRONMENTAL PROTECTION AGENCY - ELECTROPLATING POINT SOURCE CATEGORY (INTERIM STANDARDS).
Federal Register, Vol. 40, No. 80, 18130-39 (1975). 10 p, 9 tab.

Descriptors: *Water quality standards, *Industrial wastes, *Water pollution control, *Regulation, *Federal government, Standards, Legal aspects, Water law, Administration, Water pollution, Water pollution sources, Water quality control, Chemical wastes, Effluents, Pollutants, Technology, Environmental engineering, Waste disposal.
Identifiers: Administrative regulations, *Electroplating point sources.

The Environmental Protection Agency has amended the effluent guidelines and standards for the electroplating manufacturing point source category. The applicability of the standards is expanded to include cadmium, tin, lead, aluminum and iron. The regulation requires the achievement by not later than July 1, 1977 of effluent limitations for point sources which require the application of the best available technology economically achievable, and the achievement by new sources of a Federal standard for control of the discharge of pollutants which reflects the greatest degree of

effluent reduction achievable through the application of the best available control technology including, where practicable, a standard permitting no discharge of pollutants. (Nursey-Florida)
W76-06829

ENVIRONMENTAL PROTECTION AGENCY, ELECTROPLATING MANUFACTURING POINT SOURCE CATEGORY (STANDARDS OF PERFORMANCE FOR NEW SOURCES).
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 80, 18140-48 (1975). 9 p, 20 tab.

Descriptors: *Classification, *Industrial wastes, *Federal Water Pollution Control Act, *Water pollution control, Water pollution, Waste water(Pollution), Water pollution treatment, Water pollution sources, Waste water disposal, Water quality, Water quality control, Regulation, Administrative agencies, Wastes, Effluents, Federal government, Administration.
Identifiers: Administrative regulations.

Pursuant to the Federal Water Pollution Control Act, the Environmental Protection Agency has proposed effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources for the electroplating manufacturing point source category. The proposed guidelines achieve effluent limitations for point sources, other than publicly owned treatment works, by requiring the application of the best practicable control technology currently available. The subcategories of the electroplating manufacturing point source category included within this proposal and specifically regulated are: (1) electroplating of common metals; (2) electroplating of precious metals; (3) electroplating of specialty metals; (4) anodizing; (5) coatings; and (6) chemical etching and milling. This proposed regulation applies to users of publicly owned treatment works which fall within the description of the applicable point source category, but the pretreatment regulations apply to the introduction of pollutants which are directed into a publicly owned treatment works, rather than to discharges of pollutants to navigable waters. (Welch-Florida)
W76-06830

ENVIRONMENTAL PROTECTION AGENCY - SUGAR PROCESSING POINT SOURCE CATEGORY (INTERIM RULE).
40 Fed Reg 8498-8505 (1975). 8 p.

Descriptors: *Water quality standards, Standards, *Water pollution control, *Industrial wastes, *Regulation, *Classification, Legal aspects, Water law, Federal government, Administration, Water pollution, Pollutants, Effluents, Water pollution sources, Water quality control, Environmental engineering, Waste disposal, Technology.
Identifiers: *Administrative regulations, *Sugar processing.

The Environmental Protection Agency has amended effluent guidelines and standards for the sugar processing point source category. Effluent limitations and guidelines are established for the Louisiana, Florida, Texas, Hilo-Hamakua Coast, and Hawaii raw cane sugar processing subcategories. Existing point sources must achieve by not later than July 1, 1977, effluent limitations which require the application of the best practical control technology currently available. Existing point sources must achieve by not later than July 1, 1983 effluent limitations which require the application of best available technology economically achievable. New point sources must achieve a Federal standard for control of the discharge of pollutants which reflects the greatest degree of effluent reduction achievable through the application of the best available control technology including, where practicable, a standard permitting no discharge of pollutants. (Nursey-Florida)
W76-06831

EFFLUENT LIMITATIONS AND GUIDELINES - - PAINT FORMULATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
40 Fed Reg 8302-07 (1975). 6 p.

Descriptors: *Paints, *Classification, *Waste water(Pollution), *Waste water disposal, *Navigable waters, *Water quality control, *Water quality standards, Regulation, Administrative agencies, Waste disposal, Wastes, Federal Water Pollution Control Act, Federal government, Effluents, Landfills, Administration, Environmental control.
Identifiers: Administrative regulations.

Pursuant to the Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) has set forth effluent limitations and guidelines for the Paint formulating point source category including both the oil-base and water-base subcategories. The Act requires achievement of effluent limitations for point sources, other than publicly owned treatment works, which require the application of the best available technology economically achievable which will result in eliminating the discharge of all pollutants. Disposal of the pollutants removed from waste waters in the paint industry in the form of solid wastes and liquid concentrates usually requires only minimal custodial care, but those constituents which may be hazardous should be removed to landfill sites where there can be no horizontal or vertical migration of those contaminants to ground or surface waters. (Welch-Florida)
W76-06832

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY (EFFLUENT GUIDELINES AND LIMITATIONS).
Environmental Protection Agency, Washington, D.C.
Fed. Reg. Vol. 39 No. 195 p. 360093-36099, Oct. 7, 1974. 7 p.

Descriptors: *Water quality standards, *Classification, *Federal Water Pollution Control Act, *Fertilizers, *Discharge(Water), *Water quality control, Legal aspects, Regulation, Federal government, Water pollution, Pollutants, Water quality, Water pollution control, Water pollution abatement, Industrial wastes, Ammonium compounds, Sulfates, Economics, Economic impact, Technology, Water pollution sources, Organizations.
Identifiers: FWPCA Amendments of 1972.

The Environmental Protection Agency has given notice of proposed effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources for the fertilizer manufacturing point source category. The proposed regulation will amend present regulations by adding to the fertilizer manufacturing point source category the ammonium sulfate subcategory and the mixed and blend fertilizer production subcategory. The regulation requires the achievement by July 1, 1977, of effluent limitations for point sources which require the application of the best practicable control technology available. The regulation also requires the achievement by July 1, 1983 of effluent limitations for point sources which require the application of the best available technology economically achievable which will result in progress toward the national goal of eliminating the discharge of all pollution. Finally, the regulation requires the achievement by new sources of a Federal standard for the control of discharge of pollutants which reflects the greatest degree of effluent reduction achievable through application of the best available control technology. (Nursey-Florida)
W76-06833

DESIGN APPROVAL AND ENVIRONMENTAL IMPACT.
Federal Highway Administration, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-06834

REVIEW OF NPDES PERMITS.
Corps of Engineers, Washington, D.C.
Fed. Reg. Vol. 39 No. 191 p 35369-35373, Oct. 1, 1974. 5 p.

Descriptors: *Federal Water Pollution Control Act, Navigable waters, *Navigation, *Regulation, *Permits, Legal aspects, Federal government, Water law, Water quality, Water quality control, Water pollution, Water pollution sources, Water pollution effects, Water pollution abatement, Industrial wastes, Pollutants, Water utilization, Solid wastes, Water pollution control.
Identifiers: *FWPCA Amendments of 1972, *National Pollution Discharge Elimination System.

The Secretary of the Army has given notice of a proposed regulation prescribing the policy, practice and procedure to be followed by all District and Division offices in their review of proposed National Pollution Discharge Elimination System (NPDES)permit applications as to their effect on navigation and anchorage. One provision of the regulation is that no NPDES permit will be issued if it will cause substantial impairment to navigation and anchorage of any of the waters protected by the Federal Water Pollution Control Act. Furthermore, in reviewing a proposed NPDES discharge the District Engineer should consider all appropriate information and data available concerning the effects of the discharge and consult with the appropriate District Commander of the Coast Guard. The proposed regulation also specifies when the District Engineer shall notify the permit applicant of his decision, and what conditions the District Engineer may attach to an approved permit. (Nursey-Florida)
W76-06837

NEVADA WATER POLLUTION CONTROL REGULATIONS.
In: 1975 BNA Environmental Rep. 841:0501-5(
(State Comm'n of Environmental Protection Adopted 1972, amended 1974). 56 p, 53 tab.

Descriptors: *Nevada, *Waste disposal, *Wate quality standards, *Water utilization, *Wate quality control, Classification, Permits, Sewers Potable water, Water pollution, Water policy Water resources development, Water sports Aquatic life, Agriculture, Regulations, State ju risdiction.

To prevent the unauthorized pollution of Nevad waters, the State Commission of Environmenta Protection promulgated water pollution contro regulations. Due to the harmful effects caused b unauthorized waste discharges, a permit must no be obtained before any person or entity ca discharge wastes into state waters. A permit is als required before the construction of or additions t privately or municipally owned waste discharg sewer systems. Provisions pertaining to the appli cation for, issuance and revocation of these pe mits are presented. In addition, the regulation prescribe water quality standards for state waters These standards will vary depending on whethe the water is used for agricultural purposes aquaticlife, water contact sports, boating an aesthetics, drinking water supply, industria supply, or wildlife propagation. All waters, how ever, irrespective of their use, will have to mee the minimum specifications for the two major clas sifications: class A waters, which are located i areas of little human habitation; and beneficial us waters, which are closely associated with th drinking water supply. These two classification require minimum standards for floating solid

fecal coliforms, total phosphate, total dissolved solids, dissolved oxygen, temperature, hydrogen ion concentration, settable solids, and sewage, industrial or other wastes. (Hoffman-Florida)
W76-06838

NEBRASKA WATER QUALITY STANDARDS.
In: 1973 BNA Environmental Rep. 836:0501-23 (Dept. of Environmental Control water Quality Standard Applicable to Nebraska Waters, 1972 as amended 1973). 23 p, 7 tab, 2 fig, 2 append, 2 chart.

Descriptors: *Water quality standards, *Nebraska, *Legislation, *Federal Water Pollution Control Act, Water pollution sources, Surface waters, Water quality control, Law enforcement, Regulation, Hydrogen ion concentration, Dissolved solids, Dissolved oxygen, Odor-producing algae, Temperature, Water pollution control, Water pollution treatment, Water pollution, Water policy.
Identifiers: *Antedegradation policy.

The state of Nebraska, pursuant to the Federal Water Pollution Control Act, has promulgated water quality standards to protect and enhance the quality of state waters. These standards set forth minimum general criteria which must be met a by all state surface waters. Because of various water use requirements, the standards also require that state waters be classified into various categories having specific water quality criteria that must be met in addition to the general criteria. These criteria relate to the following factors: fecal coliform organisms; taste and odor producing substances; suspended colloidal or settable solids; toxic and deleterious substances; temperature; dissolved oxygen; hydrogen ion; total dissolved solids; oil and floating substances; and aesthetic condition. To insure compliance with these standards, a comprehensive monitoring program has been set up. This monitoring will be accomplished through the data collected from over 250 sampling sites across the state. In addition to the water quality criteria, an antedegradation plan is put into effect to prevent the pollution of high quality state waters which are presently above the minimum criteria. Under this plan any industrial or private project constituting on increased source of pollution will be required to provide the necessary waste treatment needed to maintain the current water quality level. (Hoffman-Florida)
W76-06840

DEPARTMENT OF ENVIRONMENTAL RESOURCES V. FLYNN (PENNSYLVANIA CLEAN STREAMS LAW - ON-SITE SEWAGE DISPOSAL SYSTEMS).
For primary bibliographic entry see Field 6E.
W76-06845

METRO SEWER DIST. V. CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RY. CO. (RAILROAD'S DUTY TO MAINTAIN WATERCOURSES OVER WHICH RAILROAD IS CONSTRUCTED).
For primary bibliographic entry see Field 6E.
W76-06846

SUSSEX V. DEPT. OF NATURAL RESOURCES (ABSENCE OF SAFE MUNICIPAL WATER SUPPLY A NUISANCE).
For primary bibliographic entry see Field 6E.
W76-06847

WARREN SAND AND GRAVEL CO, INC V COMMONWEALTH DEPT OF DEPT OF ENVIRONMENTAL RESOURCES (DREDGING OF BED OF RIVER FOR SAND AND GRAVEL).
For primary bibliographic entry see Field 6E.
W76-06849

MOWRER V. ASHLAND OIL AND REF. CO. (ASSESSMENT OF DAMAGES FOR OIL CO'S WATERFLOOD OPERATION).
For primary bibliographic entry see Field 6E.
W76-06852

HOFF V. EHRLICH (DOMINANT ESTATE'S RIGHT TO DRAINAGE EASEMENT FOR NATURAL AND WASTE WATER ACROSS SERVIENT ESTATE).
For primary bibliographic entry see Field 6E.
W76-06856

SURVEY OF CURRENT ENVIRONMENTAL RESEARCH ON SAN FRANCISCO BAY AND DELTA WATERS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6G.
W76-06911

SAN FRACISCO BAY AND DELTA SYSTEM: A SELECTED BIBLIOGRAPHY,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 2L.
W76-06912

WATER RESOURCES PROBLEMS RELATED TO MINING.
American Water Resources, Association, Minneapolis, Minn.
Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota. 236 p. Hadley, R. F., and Snow, D. T., editors. $15.00.

Descriptors: *Mining, *Mine drainage, *Water resources, *Water pollution sources, *Conferences, Mineral industry, Coal mines, Industrial water, Water rights, Legal aspects, Spoil banks, Mine wastes, Water pollution, Water quality, Groundwater, Rivers, Streams, Acid mine water, Geochemistry, Chemical reactions, Heavy metals.

The purpose of the symposium was to examine many of the questions that deal with water resources problems related to mining. The mining industry is faced with problems of controlling stream and aquifer pollution, waste disposal, transport of solids by water, leaching of ores and tailings, and water supplies. Data and interpretations from studies of mine drainage, mine-waste management, mine hydrology, acquisition of water supplies, and environmental impacts of mining operations were considered. While many of the problems are far from satisfactory solution, the symposium revealed that efforts by the scientific community and the mining industry are making good progress toward solving many of the problems. (See W76-06939 thru W76-06956) (Sims - ISWS)
W76-06938

PREPLANNING MINING OPERATIONS TO REDUCE THE ENVIRONMENTAL IMPACT OF MINE DRAINAGE ON STREAMS,
Union Carbide Corp., Tarrytown, N. Y. Aquatic Environmental Sciences.
E. E. Herricks, J. Lairns Jr., and V. O. Shanholtz.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 1-11. 4 fig, 7 ref.

Descriptors: *Mining, *Water pollution, *Pollution abatement, *Streams, Coal mines, Strip mines, Strip mine wastes, Drift mining, Mine drainage, Mine wastes, Mine water, Waste dumps, Waste treatment, Waste water treatment, Project planning, Water quality, Model studies.
Identifiers: *Preoperational planning.

One aspect of mining management practice made important by increased environmental concern is the restoration and reclamation of streams and rivers affected by mine drainage. Streams and rivers must be an integral part of the total mined land reclamation effort because when in good condition they can receive and transform industrial, municipal, or mine wastes and furnish other economic and aesthetic benefits - these benefits may be seriously reduced or destroyed if the stream ecosystem is badly overloaded. The consequence of this overload is a severaly polluted stream or river which may be highly visible evidence of the neglect or mistakes of a mine operator. A low cost solution to the problem of mine drainage disposal is optimal utilzation of stream receiving capacitty based on an understanding of physical-chemical relationships, and biological assimilative capacity. In most cases data of biological, hydrologic or water quality importance is not available and is quite costly to obtain. Hydrologic and water quality models have been applied to a typical mine drainage situation. This technique provides a low cost method of environmental data acquisition encouraging development of a data base to include streams and rivers in preoperational planning efforts. (See also W76-06938) (Sims-ISWS)
W76-06939

LEGAL PROBLEMS IN THE ACQUISITION OF SUITABLE WATER SUPPLIES FOR OIL SHALE OPERATIONS IN WESTERN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Environmental and Natural Resources Law.
For primary bibliographic entry see Field 3E.
W76-06940

EVALUATION PROCEDURE OF CRITICAL FACTORS OF MINING IMPACT ON GROUND WATER RESOURCES,
Moody and Associates, Inc., Meadville. Pa. Environmental Services Div.
J. F. Howard, and R. E. Wright.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 22-31. 6 fig.

Descriptors: *Groundwater, *Mining, *Environmental effects, *Evaluation, Water balance, Groundwater recharge, Infiltration, Surface waters, Water pollution, Spoil banks, Model studies, Assessments, Planning, Environment.
Identifiers: *Impact assessments.

Data gathering, evaluation, and planning required to satisfy government environmental regulations can also provide an effective data base which can be used to optimize efficiency and safety of mining operations. Attendant cost savings should then result both in terms of actual production efficiency and minimizing costly governmental and private citizen confrontations. One of the most essential components of long-term environmental effects from mining is the water resource system. It is important that the mine operator adopt the philosophy that significant opportunity to better develop and manage his mining operations can be realized by both promptly and objectively addressing the problem of environmental impact assessment. This opportunity for ultimate cost savings is maximized in proportion to the qualified expertise employed to acquire a comprehensive and defensible hydrogeologic data base, as early as possible in the initial exploration program. The procedure presented is general in nature, in order to afford the flexibility required to incorporate site specific variables, as well as regulatory agency-specific variables to enable its ubiquitous application. Regardless of the locale in which it is employed, it will provide a circumspect evaluation of the hydrogeologic system, as it can best be managed to maintain acceptable environmental quality and to provide profit levels which will in-

sure the needed growth of mineral resource development in the United States. (See also W76-06938) (Sims - ISWS)
W76-06941

THE HYDROLOGY OF AN ACID MINE PROBLEM,
Idaho Univ., Moscow.
B. D. Trexler, Jr., D. R. Ralston, W. Renison, and R. E. Williams.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 32-40. 6 fig, 1 ref.

Descriptors: *Mine drainage, *Mining, *Acid mine water, *Water pollution, *Mine drainage, *Idaho, Surface waters, Groundwater, Groundwater recharge, Infiltration, Hydrology, Streams, Water pollution sources, Water pollution control, Groundwater movement, Dye releases, Water quality, Pollution abatement.
Identifiers: Reduction of recharge, *Bunker Hill Mine(Idaho).

Acid mine drainage from the Bunker Hill Mine discharges into the Bunker Hill tailings pond and constitutes a major portion of the treatment cost. The discharge averages 2,700 gallons per minute of water at an average pH of 3.3. The availability of water to transport acid salts throughout the mine is second in importance only to the heterogenous presence of pyrite in the ore. Hydrographs of certain flows within the mine and local streams show similar trends. This similarity implies direct interconnection between the land surface water in the mine. Recharge to the mine has been identified in four areas. First is an area of subsidence and related fractures resulting from mining by caving. Second is a drift and stope which intersects the streambed of Milo Creek. Third and fourth are areas where the close proximity of the stopes to the land surface may have induced fractures due to subsidence of intersected previously faulted areas. Drainage facilities may be designed to bypass the surface runoff from the recharge areas and sealants may reduce direct infiltration. Reduction of recharge to the mine will minimize the treatment cost. (See also W76-06938) (Sims - ISWS)
W76-06942

IMPACT OF ARGO TUNNEL ACID MINE DRAINAGE, CLEAR CREEK COUNTY, COLORADO,
Colorado School of Mines, GoldenDept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
J. M. Boyles, D. Cain, W. Alley, and R. W. Klusman.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 41-53. 7 fig, 5 tab, 11 ref. NSF-SOS GY-10798

Descriptors: *Mining, *Acid mine water, *Mine drainage, *Heavy metals, *Colorado, Water quality, Water treatment, Water pollution, Water pollution sources, Neutralization, Lime, Pollution abatement, Pollutant identification, Iron, Copper, Zinc, Cadmium, Manganese, Laboratory tests, Sampling, On-site data collections.

The Argo tunnel acid mine drainage, Idaho Springs, Colorado, was investigated concerning its impact on the water quality of Clear Creek and possibilities for minimizing this impact. Laboratory studies indicated the following order of precipitation of Argo's heavy metals with rising pH: Fe, Cu, Zn, Cd, Mn. This order of precipitation was substantiated by data from extensive water sampling in the Argo area. On the basis of the USPHS drinking water standards, Fe and Mn were the most serious contaminants introduced into Clear Creek. However, the data indicates that Cu, Zn, and Fe from the Argo drainage will be detrimental to fish and other aquatic life downstream. Metal concentrations in Clear Creek downstream from the Argo drainage will generally be the greatest during the winter months when the flow of Clear Creek is low. The heavy metal content of limonite coatings on rocks downstream from the Argo drainage reflects the order of precipitation of heavy metals in the creek water. Fly ash, lime, limestone, and soda ash were used to neutralize Argo water, with lime giving the best results. Calculations indicated that neutralization of Argo water may be economically feasible if Cu, Zn, and possibly Mn, are recovered. (See also W76-06938) (Sims - ISWS)
W76-06943

RADIOCHEMICAL POLLUTION FROM PHOSPHATE ROCK MINING AND MILLING,
National Field Investigations Center Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-06944

THE APPLICATION OF SPARK SOURCE MASS SPECTROMETRY TO THE ANALYSIS OF WATER SAMPLES,
Accu-Labs Research, Inc., Wheatridge, Colo.
For primary bibliographic entry see Field 5A.
W76-06945

CHEMICAL KINETICS OF NEUTRALIZATION OF ACIDIC WATER BY CRUSHED LIMESTONE,
Pennsylvania State Univ., University Park Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W76-06946

ENGINEERING, ENVIRONMENTAL AND ECONOMIC PLANNING FOR COAL REFUSE DISPOSAL,
D'Appolonia (E.) Consulting Engineers, Inc., Pittsburgh, Pa.
J. H. Poellot, and R. G. Almes.
In: Water Resources Problems related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 99-108. 4 fig, 2 tab.

Descriptors: *Mining, *Coal mines, *Mine wastes, *Solid wastes, *Coal mine wastes, Planning, Economics, Engineering, Environmental effects, Operating costs, Waste disposal, Water pollution, Water pollution control, Infiltration.
Identifiers: *Coal refuse disposal.

In the past, coal refuse from underground mining has been considered only as a waste material to be disposed of as cheaply as possible, with little or no concern about the influence various mining and preparation processes have on the disposal of the refuse. Increasing concern for the environmental effects of refuse disposal and the costs of minimizing environmental damage have resulted in an increased interest in planning the refuse disposal operation and an increased awareness of the overall costs of refuse disposal. Proper planning of a disposal facility must consider all cost both capital expenditures and operating costs over the life of the facility, as well as the effect of mining and preparation plant operations on the cost of refuse disposal. Optimizing the total coal refuse disposal operation requires planning that begins while the mining and preparation methods are being planned. However, decisions concerning the mining and preparation methods are frequently made without consideration of the refuse disposal operation. Even in these cases, the total cost of refuse disposal and the environmental impact can be minimized by considering in detail the alternative site and methods of disposal which are available. (See also W76-06938) (Sims - ISWS)
W76-06947

WATER RESOURCES PROBLEMS AND SOLUTIONS ASSOCIATED WITH THE NEW LEAD BELT OF S.E. MISSOURI,
Missouri Univ., Rolla.
M. G. Hardie, J. C. Jennett, E. Bolter, B. Wixson, and N. Gale.
In: Water Resources Problems Related to Mining; Prceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 109-122. 8fig, 4 tab, 8 ref.

Descriptors: *Lead, *Mining, *Water pollution, *Missouri, Water pollution sources, Water quality, Heavy metals, Streams, Lakes, Sediments, On-site investigations, Surveys, Measurement, Sampling, Fish, Fish toxins, Algae, Nutrients, Zinc, Cadmium, Water pollution control, Industrial water, Industrial wastes.
Identifiers: *Clearwater Lake(Mo), Smelters.

The discovery of rich lead deposits in southeastern Missouri in 1955 has led to the indudstrial development of this previously rural Missouri area. Since initial production was begun in 1967, are production has increased so that 488,200 tons of lead were produced in 1973. Data has been collected relative to the quality of regional air, soils, streams, flora and fauna for the past four years. This information has been used by both industry and government in reviewing regulations and production practices and assists in reaching satisfactory solutions to control possible sources of pollution. This paper discussed some of the water resources problems and their solutions within the New Lead Belt. There were generally few differences between control and receiving streams in regard to physical and chemical parameters. Higher turbidity and suspended solids were found in samples taken at or near industrial outfalls with periodically elevated levels of phosphorus and nitrogen occurring in streams having occasional algal blooms. Most of the phosphorus and nitrogen present is tied up in the aquatic life forms or in dissolved compounds. Many of these are probably products of the stream biota. A relatively high carbonate content and slightly basic pH (7.8-8.3) account for minimal levels of dissolved heavy metals being present. The comparison of filtered versus unfiltered stream water samples has shown that considerable quantities of heavy metals are present in the finely divided, suspended particulate state. Heavy metals contents in the streams have exceeded those standards set by the Missouri Clean Water Commission on a relatively few occasions. (See also W76-06938) (Sims - ISWS)
W76-06948

POTENTIAL OF MINE AND MILL SPOILS FOR WATER QUALITY DEGRADATION,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-06949

COAL MINING AND ITS EFFECT ON WATER QUALITY,
Ohio Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-06950

GROUND WATER LEACHING OF JIG TAILING DEPOSITS IN THE COEUR D'ALENE DISTRICT OF NORTHERN IDAHO,
Idaho Univ., Moscow.
For primary bibliographic entry see Field 5B.
W76-06951

GROUND-WATER MOVEMENT THROUGH AN ABANDONED TAILINGS PILE,
Idaho Bureau of Mines and Geology, Moscow.
For primary bibliographic entry see Field 5B.
W76-06952

WATER PROBLEMS IN ALBERTA OILSANDS DEVELOPMENT,
Alberta Univ., Edmonton.
A. H. Laycock.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 184-200. 8 fig, 4 tab, 15 ref.

Descriptors: Oil, *Sands, *Canada, Water resources, Water supply, *Hydrologic budget, Industrial water, Oil industry, Surface waters, Rivers, Groundwater, Geology, Effluents, Spoil banks, Water policy, Water reuse, Evapotranspiration, Strip mines, *Mine wastes.
Identifiers: *Oilsands, Alberta, *Athabasca River(Alberta), Tailings.

The subject was presented in four stages: (1) a general survey of the Alberta oilsands resource and the status of its development, (2) a review of internal water balance patterns for the major plants, (3) a discussion of external water balance relationships, and (4) suggestions of alternative ght be resolved. The oilsands are located in northeastern and northcentral Alberta with current development north of Fort McMurray about 300 miles from Edmonton. The Alberta Energy Resources Conservation Board has estimated the oil content of these sands as 895 billion barrels. The present surface mining is being done about 20 to 25 miles north of Fort McMurray to the west of the Athabasca River. Very large scale operations and a large amount of water is to be used in the extracting and upgrading operations. The anticipated water balance in the period 1983-1991 was initially assumed to have involved the use of much more reclaimed water than raw river water. In the more recent estimates, the ratios are approximately two parts raw water to one of reclaimed waters. Potential evapotranspiration normally exceeds precipitation by about two inches per year. A strong reason for conservation of water supply and for utilization of local supplies in Alberta is the problem of having more on hand within the lease areas than can be disposed of by evaporation and other means. If local supplies can be used or reused in place of water from the major rivers, especially in the wetter years, the problems of effluent disposal may be reduced. (See also W76-06938) (Sims - ISWS)
W76-06953

WATER AND THE BRITISH COLUMBIA MINING INDUSTRY,
Ker, Priestman and Associates, Ltd., Victoria, (British Columbia).
W. A. Ker.
In: Water Resources Problems Related to Mining; Proceedings No. 18, June 1974. American Water Resources Association, Minneapolis, Minnesota, p 201-209. 2 fig, 1 tab.

Descriptors: *Mining, *Mills, *Water supply, Water resources, *Canada, Copper, Water reuse, Water policy, Water permits, Water conservation, Industrial water, Planning, Economics, Environment, Water pollution control.
Identifiers: *British Columbia, Tailings.

An adequate supply of water is essential for a successful mining operation. Without it, some of the richest deposits in the world would prove to be of little value as the concentrates could not be produced economically. In British Columbia, with its abundance of lakes and fast flowing rivers, it is taken for granted that there is an ample supply of water for every conceivable purpose. While this may be true in certain areas, it is found, on closer investigation, that the rivers and streams in the majority of the Province are subject to extreme fluctuations in flow, with the result that conditions vary during the year from possible flooding to extreme drought. As all mining operations must operate on a year-around basis for economic reasons, this factor can prove to be of major importance, especially to a large mine. Most of the mining projects which have been developed in British Columbia over the past twenty years have been large-volume, low-grade, open pit operations. Of these, the majority have been copper producers, i.e., Gibraltar, Brenda, Lornex, Bethlehem, Utah, which are in the range of 25,000-45,000 tons per day capacity. Unless the proposed development is fortunate in being located adjacent to an adequate source of water, conveyance works of some considerable magnitude may be required to bring water to the site or, alternatively, the mill must be located some distance from the mine. In either case, the cost of operation would increase and the matter of feasibility becomes a straight study of economics. (See also W76-06938) (Sims - ISWS)
W76-06954

THE RELATION BETWEEN WATER CHEMISTRY AND MINERAL ZONATION IN THE CENTRAL CITY MINING DISTRICT, COLORADO,
Colorado School of Mines, Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
For primary bibliographic entry see Field 5B.
W76-06955

AN INTRODUCTION TO HYDROGEOCHEMICAL EXPLORATION,
For primary bibliographic entry see Field 4B.
W76-06956

OIL SPILL CONTROL, PART 1: PREVENTION,
Pace Co., Houston, Tex.
P. L. D'Alessandro, Jr., and C. B. Cobb.
Hydrocarbon Processing, Vol. 55, No. 2, p 121-124, February, 1976. 5 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Oil spills, Personnel, *Water pollution control.
Identifiers: Oil spill prevention plan.

Oil spill control can be divided into two parts: prevention and counter-measure. Prevention is planned voluntary action performed under controlled condition while countermeasure is an involuntary reaction to an emergency situation. An oil spill prevention plan consists of a comprehensive assessment of the situation followed by continuous training, testing and maintenance, and inspection. A successful program requires adequate and compete training designed to build confidence, insure competence, and provide motivation. Involving the operating personnel in the development of a spill control plan is one means of assuring a personal commitment of spill prevention. Since the installation of fail-safe devices can lead to complacency, circumstances should be created periodically in which these devices are required to work. Periodic inspection of equipment should be performed based on prepared inspection forms which list possible leak sources, required inspection frequency, and optimum timing for each inspection. A list of possible leak sources and specific items to be inspected/tested for each source is presented. This list is presented as a guide which can be tailored to fit a particular installation. It includes tank leaks, overfilling tanks, tank rupture and boilover, pipe, valve and fitting leaks (both bureied and unburied), inadequate dike volume, containment dike leaks, containment area drainage valve leaks, dike drainage, and water drawoff and tank cleaning. (Orr-FIRL)
W76-06977

WATER POLLUTION CONTROL, MIDCOURSE CORRECTION,
Texaco, Inc., Beacon, N.Y. Environmental Protection Dept.
M. A. Wiley.
Chemtech, Vol. 6, No. 2, p 134-141, February, 1976. 25 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, *Legislation, Federal Water Pollution Control Act, *Water pollution control.
Identifiers: PL 92-500.

Experiences of the petroleum industry in choosing the most cost-effective methods to meet the requirements of PL92-500 are discussed. The need for substanial improvements in this legislation is documented from several viewpoints besides the industry's. The following conclusions and recommendations were drawn based on the industry's experiences. The total annualized costs for water pollution control facilities are quite high and usually amount to about one-quarter to one-third of the capital investment. Both the capital investment and total annualized costs to taxpayers and consumers should be minimized. The limited funds available for water pollution control should be apportioned on the basis of environmental equity among all classes and categories of discharges to the same water body. Excess capacity should be avo ided in treatment plants. The existing pretreatment and user charges provided for in the Act do not encourage maximum beneficial use of the municipal systems and control of urban drainage quality. Correction at the source rather than treatment is more effective for early control of contaminated urban drainage. Sewage collection and treatment systems that are more labor-intensive should improve long-term job opportunities. Regional sewer systems are generally more expensive than local systems with greater numbers of strategically located treatment plants. The conflicting roles imposed upon the EPA by the Act should be resolved. The Act should be corrected now in mid-course, rather than be replaced with other untried regulatory concepts. (Orr-FIRL)
W76-06978

NON-POINT AND DIFFUSED WATER SOURCES: A VARIABLE SOURCE AREA PROBLEM,
Georgia Univ., Athens. School of Forest Resources.
J. D. Hewlett, and C. A. Troendle.
In: Watershed Management Proceedings Symposium of American Society of Civil Engineers, New York held in Logan, Utah, August 11-13, 1975. p 21-46 (1975) 9 fig, 18 ref.

Descriptors: *Hydrologic cycle, Hydrology, Moisture, Physical properties, Slope stabilization, Water sources, Water pollution sources.
Identifiers: *Non-point pollution, Fernow Experimental Forest(W Va), Stormflow.

Scientists at the Forest Service Timber and Watershed Laboratory in cooperation with scientists at the University of Georgia have developed a preliminary version of a completely physically based model of the land phase of the hydrologic cycle. Based on the variable source area concept, the model responds well to changes in slope length and grade, soil depth and physical properties, and antecedent moisture conditions. The model appears to simulate stormflow from experimental basins on the Fernow Forest quite well and after further testing, it should be useful elsewhere. The model will not only be useful for simulating streamflow but also as an educational tool in teaching hydrologic processes and as the basis for evaluating the impact of various management practices on non-point pollution. (Forest Service)
W76-07026

THE ROLE OF TWO MANITOBA TRIBUNALS IN ENVIRONMENTAL DECISION MAKING,
Manitoba Univ., Dept. of Civil Engineering. Winnipeg.
For primary bibliographic entry see Field 6G.
W76-07028

REPORT OF WORKING GROUP B: PROMULGATION OF ENVIRONMENTAL QUALITY STANDARDS.
For primary bibliographic entry see Field 6G.
W76-07030

A MANUAL FOR THE EVALUATION OF A STATE DRINKING WATER SUPPLY PROGRAM,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
For primary bibliographic entry see Field 5F.
W76-07032

REVIEW OF EPA RESEARCH AND DEVELOPMENT LAGOON UPGRADING PROGRAM FOR FISCAL YEARS 1973, 1974, AND 1975,
National Environmental Research Center, Cincinnati, Ohio. Advanced Water Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W76-07048

SELF-PURIFICATION OF SOME RIVERS OF THE LATVIAN SSR FROM SUBSTANCES DETERMINING THE BIOCHEMICAL OXYGEN DEMAND VALUE, (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Wood Chemistry.
E. A. Aunin'sh.
Latv Psr Zinat Akad Vestis. 3, p 23-29, 1974.

Descriptors: *Self purification, Water purification, *Biochemical oxygen demand, Rivers, *Hydrologic aspects, Aeration, Water pollution control.
Identifiers: *USSR(Latvian-SSR).

The self-purification ability of rivers is determined to a great extent by such hydrological factors as the stream velocity, the number of meanders and the roughness of the river-bed. The presence of numerous shoal and high stream velocity insure high self-purification ability and allow trasient overloading of rivers which does not cause irreversible changes in self-purification conditions. Systematic overloading significantly lowers the self-purification ability. The values of the coefficient of self-purification rate K1 and that of reaeration K2 for the rivers Rezekne, Zapadnaya Dvina and Lielupe (USSR) are presented. Recommendations are given on the use of them.--Copyright 1975, Biological Abstracts, Inc.
W76-07069

FIELD STUDIES ON OZONE INACTIVATION OF A GYMNODINIUM BREVE TOXIN,
National Marine Fisheries Service, Milford, Conn. Middle Atlantic Coastal Fisheries Center.
W. J. Blogoslawski, F. P. Thurberg, M. A. Dawson, and M. J. Beckage.
Environmental Letters, Vol. 9, No. 2, p. 209-215, 1975. 1 fig., 1 tab., 11 ref.

Descriptors: *Ozone, *Gymnodinium, *Red tide, *Toxins, *Water purification, Algae, *Florida, Water pollution treatment, Sea water, Bays, Dinoflagellates.
Identifiers: *Detoxification, *Boca Ciega Bay(Fla), St. Petersburg(Fla).

In April 1974 a red tide occurred in Boca Ciega Bay near St. Petersburg, Florida, due to the toxic dinoflagellate, Gymnodinium breve. Water samples were treated with ozone, acidified to pH 6.0, and extracted with ethyl ether. The ether was evaporated, yielding a dry powder. The powder, suspended in water, was injected intraperitoneally into mice to determine toxicity. Extracts of red tide water ozonized at or above 55 ml/min were non-toxic. Mice injected with control extracts died in 2.5-3.5 minutes and showed symptoms of respiratory irregularity, violent twitching, and loss of coordination. Bubbling of air or oxygen through samples did not eliminate their toxicity. The red color faded during ozone treatment and the dry powder was gray. Ether extracts and the dry powder of control samples were green. Toxicities of extracts from field samples of red tide water were less than extracts of laboratory cultures. Toxic red tide metabolites can cause water quality problems in shellfish depuration stations and marine laboratories. The results should interest facilities needing non-toxic seawater to rear and maintain marine organisms. (Buchanan-Davidson--Wisconsin)
W76-07099

AERATION AS A LAKE MANAGEMENT TECHNIQUE,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5C.
W76-07103

FISHERIES IMPLICATIONS OF WATER TRANSFERS BETWEEN CATCHMENTS,
Association of River Authorities (England). MAFF Hydrological Group.
For primary bibliographic entry see Field 3E.
W76-07108

ENVIRONMENTAL IMPLICATIONS OF RIVER BASIN DEVELOPMENT INCLUDING WATER QUALITY MANAGEMENT: GENERAL REPORT,
Fordham Univ. Bronx N. Y. School of Law.
L. A. Teclaff.
Working Paper No. 51, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 36 p, 46 ref.

Descriptors: *River basin development, *Environmental effects, *Water quality, *Management, Water utilization, Effluents, Standards, Economics, Projects, Evaluation, Benefits, Water pollution, Pollution abatement, Cost-benefit analysis.
Identifiers: *Impacts(Environmental).

River basin development is placed in its environmental context, and concern over environmental deterioration is identified as a force in reasserting the basin's role in water management. Impacts on water quality are seen as part of the general impact on the environment of water development and use, and efforts to control them through standards, effluent charges, and financial inducements are analyzed. Next, the institutional framework for water quality management is examined on a national and international plane, with reference to pertinent papers of the seminar. In the second part of this report, means of harmonizing the impact of water projects on the environment in general are examined and evaluated. Here, the relevant papers of the seminar show that institutionalized and legally mandated harmonization of the benefits of water projects with the environmental losses they may cause is still in an early stage of development. One of the chief reasons for the comparatively slow progress in this area is the difficulty in quantifying environmental impacts. (Bell-Cornell)
W76-07134

LEGAL AND ADMINISTRATIVE CONTROL OF THE IMPACT OF RIVER BASIN DEVELOPMENT ON THE ENVIRONMENT,
Fordham Univ. N. Y. School of Law.
For primary bibliographic entry see Field 4A.
W76-07135

THE INTEGRATED RIVER BASIN CONCEPT AND INTERNATIONAL WATER RESOURCES MANAGEMENT,
United Nations Centre for Natural Resources, Energy and Transport, New York.
For primary bibliographic entry see Field 4A.
W76-07138

ECONOMIC EFFICIENCY AND EQUITY IN WATER QUALITY CONTROL: EFFLUENT TAXES AND INFORMATION REQUIREMENTS,
Tennessee Univ., Knoxville. Dept. of Economics.
H. W. Herzog, Jr.
Journal of Environmental Economics and Management, Vol. 2, No. 3, p 170-184, February 1976. 3 tab, 19 ref.

Descriptors: *Economic efficiency, *Water quality control, *Equity, Effluents, *Taxes, Management, Programs, Assessment, Simulation analysis, Constraints, Waste treatment, Standards, Costs, Equations, Biochemical oxygen demand, Mathematical models, Systems analysis, Optimization, *Maryland.
Identifiers: *Patuxent River(Maryland), Cost minimization.

Water quality standards for any river system can be achieved under numerous management programs or assignment patterns for waste treatment responsibility. This study examines three effluent charge (tax) programs along with a management program based on equal percentage treatment. Each program is developed within the general framework of a water quality management model and is designed to minimize the total real resource cost of waste treatment subject to program constraints (information availability) and water quality standards. An assessment of the relative efficiency and equity of these programs is made within a water quality management simulation of the Patuxent River in Maryland. (Bell-Cornell)
W76-07141

USE OF STATE ESTIMATION TECHNIQUES IN WATER RESOURCE SYSTEM MODELING,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-07143

URBAN WATER MANAGEMENT AND COASTAL WETLAND PROTECTION IN COLLIER COUNTY, FLORIDA,
Black, Crow and Eidsness, Inc. Gainesville, Fla.
For primary bibliographic entry see Field 3D.
W76-07150

TIMBER MANAGEMENT INFLUENCES ON AQUATIC ECOSYSTEMS AND RECOMMENDATIONS FOR FUTURE RESEARCH,
Pennsylvania State Univ., University Park. School of Forestry.
W. E. Sharpe.
Water Resources Bulletin, Vol. 11, No. 3, p 546-550, June 1975. 27 ref.

Descriptors: *Forest watersheds, Research, *Fisheries, *Management, *Water quality, Aquatic environment, *Ecosystems.
Identifiers: *Timber management, Mutual benefits.

Recent watershed research indicates that many timber management practices have profound effects on the water quality of small headwater streams. These streams often support fisheries of high value. Current knowledge seems to indicate that a definite potential exists for a symbiotic relationship between timber and fisheries management. Maximum development of both resources is attainable only if further research efforts recognize the mutually benefiting aspects of these heretofore separate disciplines. Future research should carefully examine the complex interrelationships between small headwater aquatic ecosystems and the riparian forest environment. (Bell-Cornell)
W76-07151

DEVELOPMENT OF WATER QUALITY MANAGEMENT INDICES,
Mitre Corp., McLean, Va.
J. B. Truett, A. C. Johnson, W. D. Rowe, K. D. Feigner, and L. J. Manning.
Water Resources Bulletin, Vol. 11, No. 3, p 436-448, June 1975. 5 fig, 6 ref.

Descriptors: *Water quality, *Management, *United States, Planning, Cost allocation.
Identifiers: Indices, Ranking.

In a joint undertaking by the MITRE Corporation and the Environmental Protection Agency Office of Water Programs Operations, three indices were developed and computed: (1) an index of water quality; (2) an index of the need for abatement action; and (3) an index of the need for water quality management planning. These indices were evaluated for some 1000 planning areas (subbasins, regional planning jurisdiction, metropolitan areas, etc.) which together cover essentially all of the area of the 48 contiguous states. Values of each index were tabulated, together with identifying information for the planning area, in descending order of the index value for all planning areas in the nation. This produced a national ranking of the index values for all planning areas. Presented is an outline of the development of the three indices, and results obtained when these indices were computed for each of some 1100 areas comprising the continental United States are given. (Bell-Cornell)
W76-07152

ECONOMIC RESEARCH PERTAINING TO PROBLEMS OF LIVESTOCK WASTE MANAGEMENT AND POLLUTION CONTROL,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
L. J. Connor, and J. B. Johnson.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 33-36.

Descriptors: *Livestock, Review, *Farm wastes, Economics, Pollution abatement, Costs, Cost comparisons.
Identifiers: Economic research, *Waste management, *Pollution control, Literature reviews.

A literature review is presented on the state of the art in the economic analysis of livestock waste management and pollution control problems, major economic research findings are discussed and suggestions are made for future research. Past economic research pertaining to problems of livestock waste management and pollution control are summarized by the following categories: (1) least-cost livestock waste management systems; (2) industry structure studies pertaining to the distribution of firms by size, housing type, and waste management system; (3) nonmarket control measures for effectuating pollution control; (4) economic impact studies (static and dynamic) of nonmarket control measures; (5) economic analyses of recycling animal waste; (6) energy costs associated with alternative waste management systems; and (7) miscellaneous studies. Research studies on these problems are appraised relative to the major conclusions which can be drawn, inconsistencies in major conclusions and methodologies employed in the research studies reviewed, and apparent research voids. The impact of alternative pollution control measures are analyzed with respect to the likely effects upon individual livestock producers, the size and technology distribution of livestock production units within each industry, consumer prices, and implications for pollution control agencies. Conclusions relative to least-cost waste management systems (with and without pollution control measures assumed) are drawn wherever data are available. Research voids and areas where various research studies show conflicting results are noted. (See also W76-07154) (East Central)
W76-07157

EFFECTS OF ENVIRONMENTAL LEGISLATION OF CATTLE FEEDLOT LOCATION,
Ohio State Univ., Columbia. Dept. of Industrial and Systems Engineering.
D. L. Byrkett, E. P. Taiganides, and R. A. Miller.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 45-48.

Descriptors: Model studies, *Locating, *Costs, *Economics, Environmental effects, Legislation, Water pollution control, Legal aspects, Feed lots, *Farm wastes.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Cattle feeding.

A cost minimization linear programming model was used to study the effect of the 1972 Federal Water Pollution Control Act Amendments on the location of cattle feeding in the continental United States. Factors affecting feedlot location which were included in the model are feeder, grain and roughage availability; slaughter capacity; demand requirements; nonfeed costs; and transportation costs. The United States was divided into sixteen cattle feeding regions; all data were developed for the year 1972. This model has two unique features. One is the separate definition of regions for cattle feeding, feeders, grain, roughage, slaughter, and demand. The other is that the model considers the competition between cattle feeding and other uses for available land. This competition is modelled by increasing nonfeed costs as production in a given region increases. In regions where competition available land is great, nonfeed costs increase more rapidly; nonfeed costs increase less rapidly where competition is small. The model was then used to determine the minimum cost equilibrium location of cattle feeding. These results indicated continued growth in the southern plains and continued decline in the corn belt, eastern United States, and California. To model the effect of the Federal Water Pollution Control Act Amendments of 1972, the nonfeed costs were adjusted to describe the impact of this legislation on each cattle feeding region. Equilibrium locations were then calculated using the adjusted nonfeed costs and were compared with the equilibrium locations calculated without the legislation in effect. (See also W76-07154) (East Central)
W76-07159

ECONOMIC IMPACTS OF IMPLEMENTING EPA WATER POLLUTION CONTROL RULES ON THE UNITED STATES BEEF FEEDING INDUSTRY,
Economic Research Service, East Lansing, Mich.
J. B. Johnson, and G. A. Davis.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 49-52.

Descriptors: Legal aspects, Water pollution control, *Economic impact, *Feed lots, *Agricultural runoff, Effluents, *Farm wastes.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Point source discharges.

EPA announced effluent limitations for beef feedlots in February, 1974. By July 1, 1977, feedlots with point source discharges will be required to have in use the best practicable control technology currently available. The guidelines require no discharge of waste waters from feedlots except those in excess of control systems designed to accommodate runoff from local 10-year, 24-hour rainfalls and process generated waste waters. These guidelines are to be administered through National Pollutant Discharge Elimination System permits for beef feedlots of 1,000 head of more capacity. (However, beef feedlots of smaller capacity may be expected to comply through NPDES or State permit programs.) Presented are estimates of: (1) the number of beef feedlots which could be subject to effluent guidelines and (2) the economic impacts on the beef feeding industry. An additional $133 million capital outlay would be necessary to allow the 49,000 beef feedlots of all capacity levels with problems to be in compliance with EPA rules by 1977. This level of industry investment would be needed to provide feedlots with control systems consisting of diversion terraces, a settling basin, a retention pond, and pump irrigation equipment for distributing runoff to farmland. As things now stand, 95% of the investment would be imposed on feedlots with less than 1,000 head capacity. Investments could range from $8 to over $100 per head for feedlots of less than 1,000 head capacity adopting runoff control systems. For larger feedlots, per head investment would average $1.40 to $3.20. (See also W76-07154) (East Central)
W76-07160

IMPLICATIONS OF SELECTED NON-POINT SOURCE POLLUTION REGULATIONS FOR U.S. DAIRY FARMS,
Minnesota Univ., St. Paul.
B. M. Buxton, and S. J. Ziegler.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p 57-60.

Descriptors: *Legal aspects, *Dairy industry, *Costs, Waste storage, Waste disposal, *Farm wastes, Regulation, Pollution abatement.
Identifiers: *Non-point Source Pollution Control Regulations, *Land disposal.

Federal regulations governing the land disposal of animal wastes may be forthcoming. Some states have enacted regulations or guidelines which restrict manure disposal. This study focuses on possible non-point source pollution control regulations; the number of U.S. dairy farmers affected by alternative disposal restrictions; and, where applicable, the costs of compliance with these regulations. Alternative non-point regulations are selected from existing or proposed state guidelines and these regulations are imposed on U.S. dairy farms. The following criteria are considered: restricting dairy cows, animal units, manure tonnage, and nitrogen applied per acre, and manure disposal on rolling or steeply sloping ground. The number and proportion of producers exceeding alternative restrictions are estimated based on a recent survey of U.S. dairy producers. The number of producers in the northern United States who spread manure during winter months are estimated and the aggregate cost of manure storage calculated. In addition, the location of individual U.S. dairy farms with respect to the nearest farm residence, nearest community, and public recreational area is estimated. (See also W76-07154) (East Central)
W76-07162

FEEDLOT EFFLUENT LIMITATIONS BASED UPON EXEMPLARY OPERATIONS,
Environmental Protection Agency, Washington, D.C. Impact Analysis Agency.
J. D. Denit.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p 61-63.

Descriptors: *Legislation, *Feed lots, *Water pollution control, Effluents, Poultry, Costs, Geography, Climates, Farm wastes, Operations.
Identifiers: *Pollution control, *Federal Water Pollution Control Act.

Feedlots are required to comply with certain pollution control standards as stipulated in Sections 301, 304, and 306 of the Federal Water Pollution Control Act, as amended, 1972. In response to requirements in the Sections, a regulation which sets forth the specific effluent limitations for feedlots was promulgated on February 14, 1974.

The substance of the limitations thus established was no discharge of pollutants to navigable water, subject to an exception for discharges due to unusual rainfall conditions. The limitations impact existing feedlots with effluent limitations for 1977 and 1983, and new feedlot sources (as of September 7, 1973) with standards of performance and pretreatment standards. A general survey of exemplary feedlot operations is given with emphasis on the following: (1) salient features of the exemplary control concepts for a variety of livestock and poultry operations (with slides of actual facilities). (2) applicability of the exemplary concepts to existing facilities with pollution problems, including geographic and climatic variability. (3) courses of action available to feedlot operations and responsible governmental and institutional officials. (4) general costs of achieving the effluent limitations for farms using current data estimates. The exemplary operations discussed include facilities involving open lot production of beef cattle, swine, and sheep; and, housed lot production for poultry, dairy cattle, swine, and beef cattle. Tables of associated costs for various sizes and types of facilities are presented. (See also W76-07154) (East Central)
W76-07163

PARTNERSHIP IN POLLUTION CONTROL,
Illinois Pollution Control Board, Chicago.
R. T. Odell.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p 66-67.

Descriptors: *Water pollution control, *Legislation, *Feed lots, *Illinois, *Farm wastes, *Permits, Waste treatment, Pollution abatement.
Identifiers: *Pollution control, *Waste management.

The 1970 Illinois Environmental Protection Act established the following 3 organizations for environmental protection: (1) The Pollution Control Board, which establishes regulations to protect the environment and sits as a quasi-judicial body that rules on cases of alleged violation of regulations; (2) The Illinois Environmental Protection Agency which monitors the environment and which, along with citizens, brings alleged polluters before the Pollution Control Board; and (3) The Illinois Institute for Environmental Quality, which collates environmental information. The current Illinois Livestock Waste Regulations are intended to meet requirements of the National Pollution Discharge Elimination System, established by the Federal Water Pollution Control Act Amendments of 1972. The most important provisions provide for the handling, storage, and field application of livestock wastes; for existing and new livestock facilities to be constructed to prevent excessive outside surface waters from flowing through the feedlot and to direct feedlot runoff to an appropriate disposal or storage area; and for the location of new livestock facilities with regard to surface waters, flood plains, unsatisfactory soil conditions, and population centers. Procedures were established for inspecting feedlots under investigation. Permits are required of livestock operations with a total of more than 1000 animal units, and other livestock operations with 999 to 1000 animal units that are causing significant pollution. (See also W76-07154) (East Central)
W76-07164

THE NPDES DISCHARGE PERMIT PROGRAM FOR AGRICULTURAL POINT SOURCES,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
J. C. Nye.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes-1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p 68-70.

Descriptors: *Regulation, *Feed lots, *Permits, Effluents, Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin, *Farm wastes, Water pollution sources, Agricultural runoff, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act.

The Federal Water Pollution Control Act Amendments of 1972 have had far reaching impact on the agricultural community. Section 306(b) (1) (A) specifically identified feedlots as one of the point sources for which a Federal Standard of Performance for New Sources has had to be prepared. Concentrated animal feeding operations were identified as point sources of pollution in the Act, and therefore were required to apply for a National Pollutant Discharge Elimination System (NPDES) permit. A description is presented of how the agricultural portion of the NPDES program was implemented in Region V of the U.S. Environmental Protection Agency, for the states of Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. The methods employed to obtain applications from the large feedlots are described. The interpretation of the 'Feedlot Point Source Category, Effluent Guidelines and Standards' as published in the February 14, 1974, Federal Register and the subsequent development of an agricultural permit form are discussed. The interfacing of the Federal program with existing and proposed State programs for controlling pollution from feedlots also is discussed. A brief review of the total NPDES program is presented. (See also W76-07154) (East Central)
W76-07165

AN ILLINOIS FEEDLOT RUNOFF CONTROL PROJECT,
For primary bibliographic entry see Field 5D.
W76-07169

HYDRAULIC MODELING OF SHALLOW COOLING PONDS,
Iowa Inst. of Hydraulic Research, Iowa City.
J-C. Tatinclaux, S. C. Jain, and W. W. Sayre.
Journal of the Power Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. PO1, Proceedings paper No. 11415, p 43-53, July 1975. 6 fig, 4 ref.

Descriptors: *Cooling, *Ponds, *Hydraulic models, *Probability, *Thermal pollution, Water quality control, Reynolds number, Lakes, Equations, Effluents, Shallow water, Tracers, Forecasting.
Identifiers: *Cooling systems, Power, Probability density functions.

Increasing concern about heat pollution of streams and rivers has led Federal and state agencies to set more stringent regulations on the permissible temperature increase of bodies of water receiving heated discharges from powerplants. The cooling performance of a shallow cooling pond can be determined in a hydraulic model where the residence-time distribution function of a passive tracer is measured at the intake. It is shown that within a range of discharges, i.e., of Reynolds numbers where the flow characteristics in the lake remain similar, the lake performance for a given effluent discharge can be obtained from the results obtained for a different effluent discharge. It is shown that the prototype condenser water discharge or discharger need not be scaled down exactly in the model, but that it is sufficient to insure turbulent flow. The procedure has been applied in a model study of the cooling lake for the La Salle County Power Station, Chicago, Illinois. This cooling performance of a lake at a discharge too low to be satisfactorily modeled could be inferred from the results obtained at a higher discharge. A model study could lead to an improvement in the internal dike configuration. (Bell-Cornell)
W76-07212

LEGAL PERSPECTIVE ON WATER QUALITY MANAGEMENT,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
D. R. Blazey.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. HY5, Proceedings paper No. 11320, p 595-601, May 1975. 12 ref.

Descriptors: *Legal aspects, *Water quality, *Water pollution, *Water distribution(Applied), *Sewage treatment, Sanitary engineering, *Land use, *Industrial wastes, Environmental engineering, Planning, Sewers, Esthetics, Water consumption, City planning.
Identifiers: *Government agencies, Master plans, Regional planning.

This paper focuses upon the need of governmental agencies to have statutory authority to perform planning functions. If plans so produced are to be implemented, authority must be found to give plans compulsive force. Pennsylvania has authority of both types and is undertaking a comprehensive wastewater management planning process (COWAMP). The relationship between the state Department of Environmental Resources (DER) and municipal governments is analyzed. Considered also is the DER's authority to deny permits for sewage projects that meet water quality goals but do not satisfy or are inconsistent with comprehensive planning requirements. The DER obligation to consider broad environmental issues when evaluating applications for specific projects and to articulate standards between the municipal and state planning authority is reviewed. A cooperative relationship between the municipal and state planning authority is developed. (Bell-Cornell)
W76-07221

CLEAN AIR EQUALS DIRTY WATER,
Los Angeles Dept. of Public Works, Calif.
D. C. Tillman, and R. S. Horii.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. EE1, Proceedings paper No. 11125, p 87-90, February 1975. 2 ref.

Descriptors: *Water pollution, *Waste water treatment, *California, *Environmental engineering, *Air pollution effects, Smog, Zoning.
Identifiers: Population growth, Regional planning, Sanitary sewers.

Waste treatment facilities must be constructed if clean water is to be obtained. Proper engineering design is to provide a system that is adequate for future needs. Environmentalists are opposing designs that provide for future needs even though they are cost effective. Environmentalists concerned about the air quality state that growth means automobiles and new industries and therefore more smog. Many regulatory agencies control California's Clean Water Grant Program. Some of these agencies specify that design must provide for growth, and others say that design must not provide for growth. Thus, the quandary of municipalities is how to comply with conflicting regulations and still provide the best design. (Bell-Cornell)
W76-07228

PREDICTING IONIC DISTRIBUTIONS IN LARGE SOIL COLUMNS,
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 2G.
W76-07234

PH PROFILES IN A RIVER SYSTEM WITH MULTIPLE ACID LOADS,
Massachusetts Inst. of Tech., Boston. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-07235

THE EFFECT OF MEASURES REDUCING EUTROPHICATION ON THE PHYTOPLANKTON OF THE REITHER SEA IN TYROL (AUSTRIA), (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-07308

RESTORATION OF A EUTROPHICATED LAKE (REITHER SEA, TYROL, AUSTRIA), (IN GERMAN),
Innsbruck Univ. (Austria). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W76-07309

PERSPECTIVES ON OCEAN POLICY; CONFERENCE ON CONFLICT AND ORDER IN OCEAN RELATIONS, AIRLIE, VA., OCTOBER 21-24, 1974.
Johns Hopkins Univ., Washington, D. C. School of Advanced International Studies.
For primary bibliographic entry see Field 6E.
W76-07330

REGIONAL APPROACHES TO LAW OF THE SEA: LATIN AMERICA,
University of Chile, Santiago.
For primary bibliographic entry see Field 6E.
W76-07335

ENVIRONMENTAL POLICY AND THE OCEAN,
Johns Hopkins Univ., Washington, D.C. School of Advanced International Studies.
For primary bibliographic entry see Field 6E.
W76-07339

ALTERNATIVE APPROACHES TO ORDER: TREATY AND NON-TREATY APPROACHES TO ORDER IN THE WORLD OCEAN,
Louisiana State Univ., Baton Rouge. Law School.
For primary bibliographic entry see Field 6E.
W76-07340

ALTERNATE APPROACHES TO ORDER: INTERNATIONAL OCEAN ORGANIZATION AND THEIR REGULATORY FUNCTIONS,
American Society of International Law, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-07341

COMMENTARY ON: ALTERNATE APPROACHES TO ORDER: INTERNATIONAL OCEAN ORGANIZATIONS AND THEIR REGULATORY FUNCTIONS,
American Society of International Law, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-07343

MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972.
For primary bibliographic entry see Field 6E.
W76-07353

OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS AND COASTAL ZONE MANAGEMENT ACT AMENDMENTS.
For primary bibliographic entry see Field 6E.
W76-07354

LEGISLATION FOR OUTER CONTINENTAL SHELF R AND D.
For primary bibliographic entry see Field 6E.
W76-07355

OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS OF 1975 - PART I, PART II, PART III.
For primary bibliographic entry see Field 6G.
W76-07356

ENVIRONMENTAL LAW IN THE USA: II,
For primary bibliographic entry see Field 6E.
W76-07358

ENVIRONMENTAL LAW - STATUTORY INTERPRETATION - THE ENVIRONMENTAL PROTECTION AGENCY ENTERS THE NUCLEAR AGE -- COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. V. TRAIN 507 F2D 743 (10TH CIR. 1974),
Suffolk Univ., Boston, Mass. Law School.
For primary bibliographic entry see Field 6E.
W76-07362

CANADIAN APPROACH TO THE THIRD LAW OF THE SEA CONFERENCE,
New Brunswick Univ., Fredericton. Law School.
For primary bibliographic entry see Field 6E.
W76-07364

A CRITICAL EVALUATION OF THE NOVA SCOTIA ENVIRONMENTAL PROTECTION ACT,
Dalhousie Univ., Halifax (Nova Scotia). Law School.
D. P. Edmond.
University of New Brunswick Law Journal, Vol. 24, p 69-105 (1975). 37 p.

Descriptors: *Environmental control, *Permits, *Water resources development, *Canada, *Legislation, Regulation, Administration, Governments, Legal aspects, Planning, Water law, Administrative agencies, Control, Management, Penalties(Legal), Standards, Water policy, Water quality standards, Water permits, Waste water(Pollution), Waste disposal, Pollution abatement, Environment.
Identifiers: *Nova Scotia Environmental Act.

A general lack of environmental problems and an overriding desire to attract new development have previously resulted in a lack of environmental legislation in the Canadian Maritime provinces. Recently, however, environmental destruction has led to comprehensive legislation. The Nova Scotia Environmental Act vests policy formulation in the Minister of the Department of Environment, the Environmental Council, and the Governor in Council, with the Minister holding the responsibility for general supervision and control of environmental management and preservation. A large degree of discretionary power has apparently been conferred upon these agencies, and the Minister as there is no legislative statement about conflicts between environmental protection and other goals. Provisions for public participation in policy formulation are also lacking. While all existing plants emitting wastes are regulated by permit no precise criteria have been set out. The Act provides for the Minister to issue an order against a polluter requiring the polluter to cease, limit or alter any discharges and repair any resulting injury. Finally, the Minister is made responsible for approvals of all new facilities likely to pollute. (Welch-Florida)
W76-07365

THE 1973 JAPANESE LAW FOR THE COMPENSATION OF POLLUTION RELATED HEALTH DAMAGE: AN INTRODUCTORY ASSESSMENT,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 6E.
W76-07369

JUDICIALLY ENFORCEABLE RIGHTS UNDER NATIONAL ENVIRONMENTAL POLICY ACT,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6E.
W76-07370

TANKER HYGRADE NO. 18 V. UNITED STATES (NO RECOVERY FOR CLEAN-UP COSTS RESULTING FROM OIL SPILL IN NAVIGABLE WATERWAYS).
For primary bibliographic entry see Field 6E.
W76-07377

AMERICAN IRON AND STEEL INSTITUTE V. EPA (EPA POER TO REGULATE EFFLUENT LIMITATIONS UNDER FEDERAL WATER POLLUTION CONTROL ACT),
For primary bibliographic entry see Field 6E.
W76-07382

PORT OF COOS BAY V. CITY OF COOS BAY (TERMINATION OF WATER SERVICE TO BAY WITHIN REASONABLE EXERCISE OF POLICE POWER WHEN BAY CONTAMINATED AND THERE IS A REFUSAL TO USE ANTI-BACKFLOW DEVICE).
For primary bibliographic entry see Field 6E.
W76-07383

GULF OIL CORP V. STATE MINERAL BOARD (NAVIGABLE WATER BOTTOMS HELD IN TRUST BY THE STATE FOR THE PUBLIC),
For primary bibliographic entry see Field 6E.
W76-07387

IDENTIFICATION OF PARAMETERS IN TRANSIENT WATER QUALITY MODELS FROM STOCHASTIC DATA,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
J. J. Lizcano, R. K. Krishnan, L. T. Fan, and L. E. Erickson.
Water Air Soil Pollut. 3(3), p 261-278, 1974.

Descriptors: *Mathematical models, Model studies, *Stochastic processes, Water quality, Time lag, Input-output analysis, Streams, Unsteady flow, Gradients(Streams).
Identifiers: Bard's method.

An approach is presented for the identification of parameters in time-varying water quality models from stochastic data measured at 2 points along a stream (input-output type data). The models are plug flow models described by linear 1st order partial differential equations. The method employed is to reduce the partial differential equations to a set of ordinary differential equations with the method of characteristics from which an anlytical solution is obtained. The time-lag phenomenon presented in plug flow models is used to correlate the input-output data. A gradient method (Bard's method) is employed to identify the parameters in the correlation equation.--Copyright 1975, Biological Abstracts, Inc.
W76-07395

STUDIES ON THE BIOLOGY OF DREISSENA POLYMORPHA PALLAS IN LAKE CONSTANCE, (IN GERMAN),
Freiburg Univ. (West Germany). Limbologisches Institut.
For primary bibliographic entry see Field 5C.
W76-07400

OIL FENCE HAVING DIRECTIONAL CONTROL DEVICE,
Bridgestone Tire Co. Ltd., Tokyo (Japan). (Assignee).
T. Tezuka, H. Kawakami, and K. Miura.

U.S. Patent No. 3,939,663, 4 p, 10 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 943, No 4, p 1589, February 24, 1976.

Descriptors: *Patents, *Oil pollution, *Water pollution control, Water pollution sources, Oily water, Oil spills, Barriers, Winds, Flow, Equipment, Separation techniques.
Identifiers: Oil recovery, Control devices, Rudders.

An oil fence adapted to be positioned at an angle to its towing direction by utilizing water flow or wind force acting upon rudder plates or wind receiver plates without being subjected to any bending moment or any other undue force collects or recovers pollutants effectively from the water surface. The oil fence comprises a vertical plate, a float fixed to one side of the vertical plate, a flexible connecting means attached to the vertical plate connecting vertical plates in a water-tight manner, and directional control means attached to the vertical plate at an angle. The floating oil fence is directed at a suitable angle to a towing direction by applying a tractive force so as to collect the floating pollutants. (Sinha-OEIS)
W76-07441

METHOD FOR SEPARATING OIL FROM WATER,
Kababa Industry Co. Ltd., Tokyo (Japan); and Mitsubishi Industries Ltd., Tokyo (Japan); and Chemical (E. C.) Industries Co. Ltd., Osaka (Japan).
For primary bibliographic entry see Field 5D.
W76-07445

USE OF THE BULRUSH IN WATER MANAGEMENT, (IN RUSSIAN),
Northern Research Inst. of Hydraulic Engineering and Land Reclamation, Kazan (USSR).
For primary bibliographic entry see Field 4A.
W76-07449

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME III, THE INTERIM PROGRAM,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W76-07016

HANDBOOK OF FORECASTING TECHNIQUES,
Stanford Research Inst., Menlo Park, Calif. Center for the Study of Social Policy.
A. Mitchell, B. H. Dodge, P. G. Kruzic, C. C. Miller, and P. Schwartz.
IWR Contract Report 75-7, December 1975. 314 p, 30 fig, 26 tab, 77 ref, 2 append.

Descriptors: *Forecasting, *Future planning(Projected), *Planning, Probability, Time series analysis, Economics, Social aspects, Social change, Social values, Model studies, Computer models.
Identifiers: Trend extrapolation, Pattern identification, Probabilistic forecasting.

The report was designed to help planners in the Army Corps of Engineers improve their expertise in long range forecasting. Twelve basic methods suitable for a wide range of technological, economic, social, and environmental forecasting problems were selected and discussed. Procedures for using each method were described and illustrated with examples. Some 150 forecasting techniques were listed in the appendix. (Sims - ISWS)
W76-07062

RIVER BASIN PLANNING - BASIC CONCEPTS FOR DECISION ANALYSIS AND PLANNING FOR GRADUAL EXPANSION OF THE INFORMATION BASE,
Economic Commission for Asia and the Pacific, Bangkok (Thailand).
For primary bibliographic entry see Field 4A.
W76-07133

THE ROLE OF PREDICTIONS IN WATER RESOURCES POLICY MAKING,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W76-07136

INTERBASIN TRANSFER OF WATER RESOURCES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W76-07137

TOWARDS OPTIMAL DECISION STRATEGIES FOR REDEVELOPMENT PROGRAMS: A CASE STUDY,
Vrije Universiteit, Amsterdam (Netherlands). Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-07140

ECONOMIC EFFICIENCY AND EQUITY IN WATER QUALITY CONTROL: EFFLUENT TAXES AND INFORMATION REQUIREMENTS,
Tennessee Univ., Knoxville. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-07141

INTERTEMPORAL AND INTERGENERATIONAL PARETO EFFICIENCY,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 6B.
W76-07142

USE OF STATE ESTIMATION TECHNIQUES IN WATER RESOURCE SYSTEM MODELING,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-07143

SIMPLIFIED OPTIMIZATION OF WATER SUPPLY SYSTEM,
Nielsen and Rauschenberger A/S, Lyngby, Denmark.
For primary bibliographic entry see Field 4A.
W76-07144

COST AND PRICING RELATIONSHIPS IN WATER SUPPLY,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
For primary bibliographic entry see Field 3D.
W76-07145

HYDROLOGIC AND ECONOMIC SIMULATION OF FLOOD CONTROL ASPECTS OF WATER RESOURCES SYSTEMS,
Hydrologic Engineering Center, Davis. Calif.
For primary bibliographic entry see Field 4A.
W76-07148

HEC-5C, A SIMULATION MODEL FOR SYSTEM FORMULATION AND EVALUATION,
Hydrologic Engineering Center, Davis, Calif.
B. Eichert.
Technical Paper No. 41, The Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California, March 1974. 26 p, 12 fig, 1 tab.

Descriptors: *Water resources, *Projects, *Simulation analysis, *Flood control, Effects, Hydrology, Economics, Computer programs, Reservoirs, Alternative planning, Evaluation, Reservoir operation, Multiple purpose, Mathematical models, Systems analysis.

The HEC-5C simulation model should be a useful tool for planners to evaluate the effects of water resource projects and nonstructural alternatives in most river basins because it can accurately, quickly, and inexpensively simulate the hydrologic and economic responses of the system. This report discusses the model in terms of its need, its purpose, computer requirements, the general capabilities of the computer program, reservoir operational criteria, average annual flood damage evaluation, multiflood selection and operation, evaluation of alternative reservoir systems and of nonreservoir alternatives, model data requirements and output, and future use of the model for multipurpose systems. Considerable engineering ingenuity will be required to insure that proper data is used in the model and to insure valid results; also, the proper sequence of alternatives must be evaluated in order to determine the best plan for the reduction of damages in a basin. The model will be useful for simulating multipurpose reservoir operation. (Bell-Cornell)
W76-07149

ECONOMETRIC MODEL TO AID IN URBAN PLANNING DECISIONS,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia).
J. F. Brotchie, R. Sharpe, and A. R. Toakley.
Journal of the Urban Planning and Development Division, Vol. 99, No. UP1, Proceedings of the American Society of Civil Engineers, Proceedings paper No. 9587, p 25-46, March 1973. 5 fig, 12 tab, 6 ref.

Descriptors: *Planning, Computers, *Land use, *Mathematical models, *Systems analysis, Econometrics, Equations, Linear programming, Water resources, Optimization, Costs, *City planning, *Australia.
Identifiers: Mathematical programming, Allocations, Systems engineering, Sensitivity analysis, Port Phillip Bay(Australia), Activity-space-time model, Linear activity space model, Quadratic activity-space model.

This paper describes an econometric model for use in a systems approach to urban planning, which has the capability of allocating activities of the localized type such as residential, various densities, industrial, commercial, water and sewage systems, agricultural, and recreational to potentially suitable spaces or zones in the environment, such that some measure of merit is maximized. Merit may include the costs of establishing, operating, and servicing the activities in the spaces and the costs of interactions between activities in spaces, such as those of traffic flows, pipe networks, and economies or diseconomies of scale or proximity such as where two adjacent activities share the same service trunk, or complement each other economically. Mathematically, the model is a mathematical programming model. In general application, it is an allocation model, and particularly it is an urban planning aid. Physically, it is a computer program which includes both the model and its solution techniques. (Bell-Cornell)
W76-07232

DETENTION STORAGE CONTROL STRATEGY DEVELOPMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-07236

OPERATIONS MODELS FOR CENTRAL VALLEY PROJECT,
California Univ., Los Angelos. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W76-07237

6B. Evaluation Process

DECISION ANALYSIS FOR WATERSHED MANAGEMENT ALTERNATIVES,
Arizona Univ., Tucson, School of Renewable Natural Resources.
For primary bibliographic entry see Field 4D.
W76-06905

REPORT OF WORKING GROUP A: ENVIRONMENTAL DECISIONS ON MAJOR PROJECTS.
For primary bibliographic entry see Field 6G.
W76-07029

REPORT OF WORKING GROUP B: PROMULGATION OF ENVIRONMENTAL QUALITY STANDARDS.
For primary bibliographic entry see Field 6G.
W76-07030

HANDBOOK OF FORECASTING TECHNIQUES,
Stanford Research Inst., Menlo Park, Calif. Center for the Study of Social Policy.
For primary bibliographic entry see Field 6A.
W76-07062

THE USE OF GROUND-WATER RESOURCES IN RIVER BASIN DEVELOPMENT,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4B.
W76-07132

RIVER BASIN PLANNING - BASIC CONCEPTS FOR DECISION ANALYSIS AND PLANNING FOR GRADUAL EXPANSION OF THE INFORMATION BASE,
Economic Commission for Asia and the Pacific, Bangkok (Thailand).
For primary bibliographic entry see Field 4A.
W76-07133

THE ROLE OF PREDICTIONS IN WATER RESOURCES POLICY MAKING,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W76-07136

THE INTEGRATED RIVER BASIN CONCEPT AND INTERNATIONAL WATER RESOURCES MANAGEMENT,
United Nations Centre for Natural Resources, Energy and Transport, New York.
For primary bibliographic entry see Field 4A.
W76-07138

EX POST EVALUATION OF THE SOCIO-ECONOMIC EFFECTIVENESS OF LARGE WATER RESOURCES PROJECTS,
Water Resources Center, Budapest (Hungary).
S. Ress.
Working paper No. 55, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 5 ref.

Descriptors: *Water resources development, Economics, *Social aspects, *Costs, *Benefits, Evaluation, Engineering, Methodology, Optimum development plans, Control, Operations research, *Project post evaluation.
Identifiers: *Socio-economic effectiveness.

For the optimum socio-economic development of catchment areas and for the economically optimum realization of the operative processes planned (ex ante) on the basis thereof, the implementation of a sequence of complex control and regulation operations is necessary. The effectiveness of these operations, namely the physical, engineering, economic and social processes taking place in the catchment, is reflected by one of the most comprehensive, complex systems of evaluation, namely the analysis of socio-economic effectiveness. In this analytical system of evaluation, the costs of control measures implemented, or to be implemented, for attaining one of several definite socio-economic objectives are related to the benefits realized in the system of labor division developed in a particular catchment. The evaluation indicates further the extent to which the resources expended for meeting the demands for water management of society are utilized, as well as the role it plays on the level and rate of socio-economic development. The results of the analysis will provide, moreover, valuable information for the operation and implementation of the control and regulation processes in the catchment. (Bell-Cornell)
W76-07139

TOWARDS OPTIMAL DECISION STRATEGIES FOR REDEVELOPMENT PROGRAMS: A CASE STUDY,
Vrije Universiteit, Amsterdam (Netherlands). Dept. of Economics.
P. Nijkamp, and C. Verhage.
Working Paper No. 43, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 16 p, 1 fig, 5 tab, 5 ref.

Descriptors: *River systems, *Optimum development plans, *Cost-benefit analysis, *Projects, *Comprehensive planning, Investment, Drainage, Control, Land use, Decision making, Economics, Hydrologic aspects, Equations, Systems analysis.
Identifiers: Impact analysis.

This paper investigates how to deal with the wanted and unwanted consequences of a public investment project aimed at improving the drainage function of a riversystem in the Northern part of the Netherlands. The drainage improvement project is a part of a long-term reconstruction plan for the agricultural area involved. The main objective of the plan is to promote the economic opportunities and expand the social and cultural facilities for the regional population. Since some impacts are intangible and/or unintended, the usual cost-benefit analysis is not feasible here. However, a modified cost-benefit analysis is proposed to estimate the intangible environmental effects of the water project. An extension of the impact analysis into a dynamic framework is introduced by means of optimal control. A comprehensive regional redevelopment plan is essentially a strategy to realize an optimal spatial layout in a certain period of time, which will require knowledge about the optimal time path of the investments which change the land-use. (Bell-Cornell)
W76-07140

INTERTEMPORAL AND INTERGENERATIONAL PARETO EFFICIENCY,
Arizona State Univ., Tempe.
T. Sandler, and V. K. Smith.
Journal of Environmental Economics and Management, Vol. 2, No. 3, p 151-159, February 1976. 2 tab, 25 ref.

Descriptors: *Economic efficiency, *Resource allocation, *Benefits, Environment, Optimization, Equations, Recreation, Mathematical models, Systems analysis.
Identifiers: *Pareto efficiency, Reference group, Public goods, Private goods, Intergenerational, Intertemporal.

Proposed is an extension to the definition of Pareto efficiency in resource allocation. By introducing the concept of a reference group, the authors extend the static definition of efficiency to intertemporal and intergenerational generalizations. Efficiency conditions are derived for both private and public goods which provide benefits over time. In deriving these conditions, the paper extends the notion of efficiency to an intertemporal Pareto-optimal conception requiring the maximization of the ith individual's utility at a point of time subject to the constancy of his utility in all future periods and that of all other individuals during the relevant time span. By permitting births and deaths, a generalization of the basic model recasts the analysis into an intergenerational setting. Additional extensions involve learning by doing perpetual public goods. Included among several examples is that of water recreational facilities. The paper concludes that several of the conventional practices in public expenditure analysis do not conform to our definition of intertemporal Pareto efficiency. (Bell-Cornell)
W76-07142

DEVELOPMENT OF WATER QUALITY MANAGEMENT INDICES,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 5G.
W76-07152

PROBLEMS IN PERFORMING ENVIRONMENTAL ASSESSMENTS,
Virginia Polytechnic Inst., and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 6G.
W76-07217

ECONOMETRIC MODEL TO AID IN URBAN PLANNING DECISIONS,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia).
For primary bibliographic entry see Field 6A.
W76-07232

OPERATIONS MODELS FOR CENTRAL VALLEY PROJECT,
California Univ., Los Angelos. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W76-07237

IDENTIFYING THE PUBLIC IN WATER RESOURCE PLANNING,
Georgia Inst. of Technology, Atlanta.
G. E. Willeke.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Socity of Civil Engineers, Proceedings paper No. 12064, Vol. 102, No. WR1, p 137-150, April 1976. 7 ref. OWRT B-095-GA(2).

Descriptors: *Water resources, *Planning, *Social participation, *Social needs, Communication.
Identifiers: Demographic characteristics, Public participation.

The public is not a unitary mass, but rather is comprised of segments (publics) of the general public. Identification includes locating the publics, determining their interests and their social and demographic characteristics, and learning how to communicate with them. Publics are identified to increase the range and richness of issues and concerns brought to salience in the planning process. Identification techniques are divided into three groups: (1) self-identification, (2) third-party identification; and (3) staff identification. Self-identification is done through correspondence, petition, appeal, public hearing, election, suit, protest, and publicity. These processes may be enhanced by providing structures for self-identification. Third-party identification is done by asking

some person or group to identify those groups or individuals who should be involved. Staff identification includes analysis of associations, geographic analysis, demographic analysis, historical and comparative analysis, the use of general lists, field interviews, and analysis of affected publics. The analysis herein includes: descriptions of identification techniques; and an appraisal of the suitability of each technique, considering time, cost, legality, and effectiveness, as well as local social and political constraints. (Bell-Cornell)
W76-07238

CRITERIA FOR THE IDENTIFICATION OF AREAS OF ENVIRONMENTAL CONCERN PREPARED FOR NORTH CAROLINA LAND POLICY COUNCIL.
North Carolina Land Policy Council, Raleigh.
For primary bibliographic entry see Field 6E.
W76-07371

IDENTIFICATION OF PARAMETERS IN TRANSIENT WATER QUALITY MODELS FROM STOCHASTIC DATA,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W76-07395

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

DESALINATION MATERIALS MANUAL,
Dow Chemical Co., Freeport, Tex.
For primary bibliographic entry see Field 3A.
W76-06801

EVALUATION OF ALTERNATIVE USES OF WETLANDS,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 3F.
W76-06908

USING CORRUGATED STEEL TO SLASH SEWER COST BY 12%,
For primary bibliographic entry see Field 5D.
W76-06984

GETTING THE MOST OUT OF AN INFILTRATION/INFLOW ANALYSIS,
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 5D.
W76-06985

CIRIA ASSESSES ITS MODEL WAY TO TREAT SEWAGE.
For primary bibliographic entry see Field 5D.
W76-07014

ECONOMIC EFFICIENCY AND EQUITY IN WATER QUALITY CONTROL: EFFLUENT TAXES AND INFORMATION REQUIREMENTS,
Tennessee Univ., Knoxville. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-07141

COST AND PRICING RELATIONSHIPS IN WATER SUPPLY,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
For primary bibliographic entry see Field 3D.
W76-07145

OPTIMIZATION OF EVAPORATION POND COST,
Bechtel Inc., Gaithersburg, Md.
For primary bibliographic entry see Field 5D.
W76-07147

ECONOMIC RESEARCH PERTAINING TO PROBLEMS OF LIVESTOCK WASTE MANAGEMENT AND POLLUTION CONTROL,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-07157

THE RED SEA LIGHTS AGREEMENT: ANOTHER INSTANCE OF INTERNATIONAL COST-SHARING,
Bureau of Economic and Business Affairs, (State), Washington, D.C. Office of Maritime Affairs.
For primary bibliographic entry see Field 6E.
W76-07366

6D. Water Demand

AN EXPLORATORY APPLICATION OF TWO METHODS OF ANALYZING WATER USE TIME SERIES,
Hawaii Univ., Honolulu. Water Resources Research Center.
J. E. T. Moncur.
Technical Report No. 91, June 1975. 16 p, 2 fig, 3 tab, 6 ref. OWRT A-045-HI (1) 14-31-0001-4011.

Descriptors: *Water demand, *Prices, *Time series analysis, *Regression analysis, Water utilization, Estimating, *Hawaii, *Water consumption, Methodology.
Identifiers: *Spectral density.

The usefulness of two procedures for analyzing water use time series data was investigated. A simple procedure for translating price data into a form suitable for a standard regression estimation of the demand function for water is first noted. Then a simple spectral density estimation model is applied to Honolulu water consumption data in search of identifying periodicities or cyclical regularities of water demand. Both procedures show promise of useful interpretation, though the conclusions are tentative.
W76-06813

MONTANA WATER USE ACT.
For primary bibliographic entry see Field 6E.
W76-06839

LEGAL PROBLEMS IN THE ACQUISITION OF SUITABLE WATER SUPPLIES FOR OIL SHALE OPERATIONS IN WESTERN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Environmental and Natural Resources Law.
For primary bibliographic entry see Field 3E.
W76-06940

THE SOUTHEAST FLORIDA EXPERIENCE IN RESOLVING DEVELOPMENT AND ENVIRONMENT CONFLICTS,
Reynolds, Smith and Hills, Jacksonville, Fla.
For primary bibliographic entry see Field 6G.
W76-07153

PROBLEMS UNDER STATE WATER LAWS: CHANGES IN EXISTING WATER RIGHTS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 6E.
W76-07233

6E. Water Law and Institutions

COMMUNITY RESPONSE TO THE FLOOD DISASTER PROTECTION ACT OF 1973,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Rural Sociology.
For primary bibliographic entry see Field 6F.
W76-06810

NEPA AND THE CZMA: THE ENVIRONMENTAL IMPACT STATEMENT AND SECTION 306 GUIDELINES,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 6G.
W76-06817

DATA MANAGEMENT IN COASTAL ZONE PLANNING,
Dames and Moore, Los Angeles, Calif. Planning Systems Group.
For primary bibliographic entry see Field 7C.
W76-06818

SITING OF ENERGY FACILITIES IN THE COASTAL ZONE -- A CRITICAL REGULATORY HIATUS,
Marshall-Wythe School of Law, Williamsburg, Va.
For primary bibliographic entry see Field 6G.
W76-06819

ENVIRONMENTAL LAW- THE 1972 AMENDMENTS TO THE FEDERAL WATER POLLUTION CONTROL ACT EXTEND DREDGE AND FILL JURISDICTION ABOVE THE MEAN HIGH WATER LINE. UNITED STATES V. HOLLAND, 373 F. SUPP. 665 (MD FLA. 1974).
For primary bibliographic entry see Field 5G.
W76-06820

LEGAL ASPECTS OF LIMITED ENTRY FOR COMMERCIAL MARINE FISHERIES,
Louisiana State Univ., Baton Rouge. Law School
H. G. Knight, and J. P. Lambert.
Report to National Marine Fisheries Service Louisiana State University (Center for Wetland Resources), Oct. 1975. 123 p, 2 fig.

Descriptors: *Fish management, *Fish conservation, *Fisheries, *Commercial fishing, Fish stocking, Fish populations, Fishing, Ecology, Number fish per acre, Fish harvest, Fish establishment, Jurisdiction, Fish farming.
Identifiers: *Limited entry.

Limited entry is a management concept designed to provide the maximum sustainable fish yield while at the same time reducing the effort applied to catching fish in a commercial fishery. The establishment of a limited entry system generally requires the following elements: (1) acquisition of a jurisdictional base for management; (2) determination of allowable catch; (3) determination of optimal amount of effort; (4) international allocation of resources; and (5) the allocation of entry rights, both initial and subsequent. This report presents a detailed legal analysis pertaining to each of these elements. It also fully explores the domestic and international jurisdictional problems which may arise in the development of a limited entry system. The authors conclude that the diverse needs and economics of individual fisheries and fish industries prevent the drafting of a generalized draft of legislation for a model limited entry system; nevertheless, several issues should be explored by drafts of a limited entry system, including: the purpose and rationality of the program; the determination of an optimal level of effort; the allocation of entry permits; and interstate and state-federal coordination problems. (Hoffman-Florida)
W76-06821

NATIONAL ATTEMPTS TO REDUCE LOSSES FROM FLOODS BY PLANNING FOR AND CONTROLLING THE USES OF FLOOD-PRONE LANDS.
General Accounting Office, Washington, D.C.
For primary bibliographic entry see Field 6F.
W76-06822

DIFFUSED SURFACE WATERS IN MISSISSIPPI,
H. A. Schutz, III, and J. B. Tohill.
Mississippi Law Journal, Vol. 41, No. 1, p 118-146 (1975). 29 p.

Descriptors: *Alteration of flow, *Mississippi, *Surface waters, *Legal aspects, *Reasonable use, Drainage, Drainage systems, Drainage water, Surface runoff, Water resources, Erosion, Flooding, Adjacent landowners, Common law, Civil law, Equity, Judicial decision, State governments, Penalties(Legal), Water law, Economics, Cost-benefit analysis, Water conveyance.
Identifiers: *Common-enemy rule, Injunctions.

An analysis of the Mississippi case law concerning diffused surface water indicates that the Mississippi courts traditionally have followed a modified version of the 'common-enemy' rule. This rule generally allows a landowner to change the flow of diffused surface waters where the change causes no unnecessary harm. Recently however, the Mississippi courts have injected a reasonableness standard, balancing the benefits and costs to the owners of all affected land. Thus, the Mississippi courts appear to be moving closer to a 'reasonable-use' test as the best method to protect the interests of both landowners and the general public.
W76-06823

CLASSICAL WRITERS OF INTERNATIONAL LAW AND THE ENVIRONMENT,
Montana Univ., Missoula. Dept. of Political Science.
F. L. Grieves.
Environmental Affair, Vol. 4, p. 309-322 (1975), 14 p.

Descriptors: *International law, *Environmental effects, *Water quality control, *Law of the sea, *International waters, Foreign trade, Foreign waters, Water utilization, Water resources, Mining, Water pollution, Water pollution control, Water pollution abatement, Pollutants, Water quality control, Navigation, Economics, Ownership of beds, Governments, Governmental interrelations, Water law, Navigable waters.
Identifiers: *Seabed mining.

Some important environmental problems encountered today stem from legal principles inherited from the classical period of international law. Although these principles were developed to meet then current problems, theyn are not adequate to handle the international situation which exists today. The early classical writers of international law, dealing with seemingly limitless natural resources, asserted the principle of free use of the sea--the fruits of the sea were available to anyone who could take them. While later writers became aware of the need to limit the use of the seas to some extent the predominant principle in international law continues to be the widespread exploitation of the seas with as few controls as possible. A counter principle, better adapted to the environmental problems faced today is the less popular idea of res communis. Under this concept the seas are community property to be managed for the good of all mankind. If accepted, the res communis concept would provide a vehicle for stabilizing and guiding the use of international areas as well as for avoiding wasteful, uncontrolled unilateral exploitation of international resource. (Nursey-Florida)
W76-06825

THE ENVIRONMENT AND THE LAWYER,
Environmental Protection Agency, Washington, D.C.
J. R. Quarles, Jr.
Federal Bar Journal, Vol 33, p. 112-118 (1974), 7 p.

Descriptors: *Federal Water Pollution Control Act, *Clean Air Act, *Legal aspects, *Environmental effects, *Federal government, Legislation penalties(Legal), Industries, Economics, Financing, Water law, Water pollution, Water pollution sources, Water pollution effects, Water quality, Water quality control, Water pollution control, Water pollution abatement, Pollutants, Water quality standards, Organizations.
Identifiers: *Environmental Protection Agency.

The Clean Air Act and the Federal Water Pollution Control Act have greatly affected the legal profession in the areas of business, industry and the environment since the acts constitute important steps in strengthening legal methods of pollution control. They have, with their numerous stringent requirements affecting attorneys with corporate practices, forced many lawyers to bring federal pollution regulations into the scope of their concern. It is hoped that environmental protection will become more and more a cooperative rather than adversary process. (Nursey-Florida)
W76-06826

CANADA AT THE THIRD LAW OF THE SEA CONFERENCE: POLICY, ROLE, AND PROSPECTS,
British Columbia Univ., Vancouver. Inst. of International Relations.
B. G. Buzan, and B. Johnson.
Law of the Sea Institute, Occasional Paper 29 (Dec. 1975). 25 p, 3 tab.

Descriptors: *Water policy, *Canada, *Law of the sea, *International law, Water resources, *Foreign countries, Jurisdiction, Navigation, Commercial fishing, Research and development, Beds, Straits, Islands, Decision making, Administration, Institutional constraints, Political constraints, Legal aspects.
Identifiers: Archipelagos, Territorial seas.

Because of Canada's dependence on the resources of the ocean, the Third Law of the Sea Conference is of prime importance to that country. To provide an insight into Canada's position at the Conference, a synopsis of Canada's pre-Conference stance on the nine major subjects to be discussed is presented. Those subjects include the following: the continental shelf; the seabed areas beyond the limits of national jurisdiction; the territorial sea; straits used for international navigation; archipelagos; offshore islands and delimitation problems; marine scientific research; fishing; the marine environment; and navigation rights in the coastal zone. At the Conference, Canada, like other nations, will have four optional levels of action to achieve its goals - unilateral, bilateral, regional and global. Because a global agreement would provide the best hope for an optimal solution to law of the sea issues, it is probably Canada's best option. Unfortunately, economic and political disagreements may well prevent the ratification of an international treaty. Thus, Canada should view unilateral action as a viable alternative. Nevertheless, if unilateral action is taken, Canada must be careful to avoid the international resistance that developed from Canada's 1970 legislation on coastal zone navigation. (Hoffman-Florida)
W76-06827

SAMPLE FLOOD PLAIN ZONING ORDINANCE FOR LOCAL UNITS OF GOVERNMENT.
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 6F.
W76-06828

ENVIRONMENTAL PROTECTION AGENCY - ELECTROPLATING POINT SOURCE CATEGORY (INTERIM STANDARDS).
For primary bibliographic entry see Field 5G.
W76-06829

ENVIRONMENTAL PROTECTION AGENCY, ELECTROPLATING MANUFACTURING POINT SOURCE CATEGORY (STANDARDS OF PERFORMANCE FOR NEW SOURCES).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06830

ENVIRONMENTAL PROTECTION AGENCY - SUGAR PROCESSING POINT SOURCE CATEGORY (INTERIM RULE).
For primary bibliographic entry see Field 5G.
W76-06831

EFFLUENT LIMITATIONS AND GUIDELINES - - PAINT FORMULATING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-06832

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY (EFFLUENT GUIDELINES AND LIMITATIONS).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06833

DESIGN APPROVAL AND ENVIRONMENTAL IMPACT.
Federal Highway Administration, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-06834

AHTANUM INDIAN IRRIGATION PROJECT.
Bureau of Indian Affairs, Washington, D. C.
For primary bibliographic entry see Field 3F.
W76-06835

WATER RESOURCES COUNCIL - FREEDOM OF INFORMATION.
Water Resources Council, Washington, D. C.
Federal Register, Vol. 39, No. 200, p. 36870-71 (1974). 2 p.

Descriptors: *Public access, *Data collections, *Federal government, *Administrative agencies, *Adoption of practices, Administrative decisions, Administration, Water law, Materials, Costs, Political aspects, Legal aspects, Political constraints, Publications, Information exchange, Public, Information retrieval.
Identifiers: *Freedom of Information Act.

The Water Resources Council has proposed the addition of a new subpart D to part 701 of Chapter VI, Title 18 of the Code of Federal Regulations describing the availability to the public of records of the Council pursuant to the Freedom of Information Act. The Council's policy is to make the fullest possible disclosure of records consistent with those obligations of confidentiality and administrative necessity reorganized by the Act. Specific exemptions from availability of information are enumerated along with a requirement that requested materials be accompanied by a reasonably specific description of the materials sought to prevent undue search or inquiry. Any requests involving a significant burden on the staff or facilities may be charged a fee, not to exceed $2.50 per half hour nor copying fee exceeding

$0.25 per page. This proposal supplements existing procedures and normal channels through which information has regularly been made available to the public. (Welch-Florida)
W76-06836

REVIEW OF NPDES PERMITS.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06837

NEVADA WATER POLLUTION CONTROL REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-06838

MONTANA WATER USE ACT.
In: 1974 BNA Environmental Rep. 831:0141-48 (Mont. Sess Laws 1973, Ch 462, Secs 1 thru 38, 1973, amended by Chs 103, 192, 238, and 265, Laws 1974). 8 p.

Descriptors: *Permits, *Montana, *Water rights, *Water resources, *Appropriation, Water conservation, Streamflow, Groundwater recharge, Groundwater, Lakes, Streams, Reservoirs, Water, Fish, Wildlife, Irrigation, Mining, Wells, Wastes, Surveys, Inspection, Investigations, Construction, Crops, Beneficial use.

The department of natural resources and conservation shall regulate water rights and establish a system of centralized records for all water rights in Montana. Any person claiming an existing water right shall furnish a declaration of existing right to the department. The department shall then file a petition for determination of existing rights in the proper district court which shall issue a preliminary decree. Hearings on the preliminary decree shall then be conducted and a final decree issued. Appeals from the final decree may be taken. On the basis of the final decree, the department shall issue to each person decreed an existing right a certificate of water right. A person may appropriate water only as provided in this act. First the applicant for appropriation must apply for a permit. The department shall then issue notice, and hearings on objections to the application shall take place. The department shall thereafter grant, deny, or modify the application; thereafter, upon actual application of water to proposed beneficial use, the applicant shall be issued a certificate of water right. (Segall-Florida)
W76-06839

NEBRASKA WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 5G.
W76-06840

MID-AMERICA TERMINAL OF KENTUCKY, INC. V OWENSBORO RIVER SAND AND GRAVEL CO (OWNER'S DREDGING NOT A TRESPASS ON LESSOR'S ESTATE IN SAND AND GRAVEL LOCATED IN RIVER BED ON SAME LAND).
532 SW2d 437-42 (Ky Ct. App 1975) 6 p.

Descriptors: *Obstruction to flow, *Kentucky, *Riparian rights, *Piles(Foundations), *Mining, Dredging, River beds, Competing uses, Relative rights, Ohio River, Sands, Gravels, Trespass, Leases, Barges, Structures.

Plaintiff owner of exclusive rights to remove sand and gravel from a river bed sought to enjoin defendant landowner from conducting activities which interfered with those rights. The plaintiff also sought to enjoin the defendant to remove all structures in the river, including pilings which the defendant had placed in the river bed as part of a temporary barge terminal. The plaintiff contended that defendant's activities constituted a trespass while the defendant argued that the riparian rights incident to ownership of the shore permitted the placing of pilings in the river bed and allowed dredging and maintenance of a barge channel. The Kentucky Court of Appeals held that each party may use its respective estate in a reasonable manner consistent with the rights of the other. The court further held that each party is entitled to prevent the other from an unreasonable exercise of rights which would deprive the other of its respective estate. (Capehart-Florida)
W76-06841

TRAX, INC. V CITY OF COLLEGE PARK (RESPONSIBILITY OF LANDOWNER FOR REMOVAL OF LANDOWNER'S OBSTRUCTION IN CREEK WHICH IS MAJOR PART OF CITY DRAINAGE).
221 SE2d 595-96 (Ga 1976). 2 p.

Descriptors: *Judicial decisions, *Georgia, *Obstruction to flow, *Drainage systems, *Cities, Stream flow, Flood control surface waters, Natural flow, Floods, Upstream, Municipal water, Adjacent land owners.

Plaintiff city sought to enjoin defendant landowner from maintaining an obstruction to the natural flow of water through a creek which was part of the surface water drainage system for the city. The plaintiff further sought to require the defendant to remove the obstruction and to restore the bed and banks of the creek to their original condition insofar as necessary to restore the natural drainage. The evidence showed that said obstruction was the major proximate cause of potential upstream flooding. Under prior case law, the city had the duty to take steps to maintain the flow of water in the creek when changes occurred which reduced the flow and made flooding of public or private property likely. The trial court directed a verdict for the plaintiff which was affirmed by the Georgia Supreme Court. (Capehart-Florida)
W76-06842

WHITE RIVER SAND AND GRAVEL REMOVAL COMMISSION V HAYES BROTHERS LAND AND TIMBER COMPANY, INC. (GRANTING LEASES OR PERMITS FOR SAND AND GRAVEL REMOVAL FROM WHITE RIVER).
532 SW2d 191-93 (Ark. 1976). 3 p.

Descriptors: *Riparian rights, *Arkansas, *Permits, *Legislation, *River beds, Regulation, Sands, Gravels, Navigable rivers, Leases, Legal aspects, Judicial decisions, State governments, Constitutional law, Real property, Rivers, River basins.

Plaintiff riparian landowner appealed the ruling of defendant commission denying the plaintiff7s application for a permit to remove sand and gravel from a portion of the river. The trial court held the 1971 statute controlling removal of sand and gravel from a limited portion of the river unconstitutional as local legislation. The Arkansas Supreme Court held that the appeal was most in view of passage by the legislature of a later act which repealed by implication the statute setting up the defendant commission. The 1975 act vested in the Department of Commerce authority and responsibility for granting leases and permits for taking sand and gravel from the beds and bars of all navigable rivers and lakes in the state. (Capehart-Florida)
W76-06843

THOMAS V HALE COUNTY (NO INJUNCTION FOR DIVERSION OF NATURAL WATER FLOW WHICH CAUSES MINIMAL DAMAGES).
531 SW2d 213-15 (Tex. Civ. Ct. App. 1975). 3 p.

Descriptors: *Municipal water, *Texas, *Ditches, *Diversion, *Storm runoff, Runoff, Surface runoff, Drainage systems, Roads, Local governments, Natural flow, Playas, Floods, Flood damage, Judicial decisions, Water conveyance.
Identifiers: *Injunctive relief.

Plaintiff landowners sought to enjoin defendant county from cutting a barrow ditch to a level which would divert the natural flow of runoff water so as to cause flooding of plaintiffs' land. In the 1950's the defendant cut a ditch to divert storm runoff from a county dirt road to a playa lake across from the plaintiffs' land. The plaintiffs' land was flooded once in the late 1950's when 12 to 15 acres were damaged. In 1975, while maintaining the dirt road, the defendant re-cut the ditch to the depth described in the plaintiffs' complaint. The evidence did not show the depth to be different from that previously maintained. The trial court denied the motion for a temporary injunction requiring the defendant to fill in the ditch pending final judgement on the permanent injunction. The Texas Court of Civil Appeals affirmed, holding that although the evidence showed diversion of water by the county, since it did not show more than a minimal probability of injury, denial of the temporary injunction was proper. (Capehart-Florida)
W76-06844

DEPARTMENT OF ENVIRONMENTAL RESOURCES V. FLYNN (PENNSYLVANIA CLEAN STREAMS LAW - ON-SITE SEWAGE DISPOSAL SYSTEMS).
344 A2d 720-25 (Pa Com Ct 1975). 6 p.

Descriptors: *Land tenure, *Pennsylvania, *Judicial decisions, *Permits, *Sewage disposal, Legal aspects, Water law, State governments, Local governments, Water pollution, Water pollution sources, Water pollution control, Water quality, Water quality control, Sewage effluents, Sewers, Waste disposal.
Identifiers: Statute of limitations.

Plaintiff state Department of Environmental Resources brought an action against defendant landowner to revoke a permit to install an on-site sewage disposal system issued to defendant under a mistake of fact. Plaintiff did not bring the action until after the expiration of the period during which an appeal could have been taken from the issuance of the permit. Defendant had meanwhile expended a substantial amount of money constructing a home on the site. The home was 75% complete at the time the action was commenced. Plaintiff contended that the proposed sewage system presented a potential danger to a downstream fish hatchery. The Commonwealth Court of Pennsylvania held that defendant had acquired a vested right in the permit despite the fact that it was issued by mistake. In reaching this decision the court found: (1) that defendant had exercised due diligence and good faith in attempting to comply with the law; (2) that he had expended substantial unrecoverable sums; (3) that plaintiff had failed to bring an appeal of the permit issuance within the specified time; and (4) that there was no proof that the sewage system would adversely affect individual property rights or the public health, safety or welfare. (Nursey-Florida)
W76-06845

METRO SEWER DIST. V. CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RY. CO. (RAILROAD'S DUTY TO MAINTAIN WATERCOURSES OVER WHICH RAILROAD IS CONSTRUCTED).
230 NW2d 651-65 (Wisc. 1975). 15 p.

Descriptors: *Railroads, *Wisconsin, *Sewerage, *Bridges, *Navigable waters, Channel improvement, Stream improvement, Dredging, Drainage, Contracts, Judicial decisions, Surface waters, Civil engineering, Sewage districts, Environmental sanitation, Watercourses(Legal aspects), Common law, Bridge construction.

Improvements made in the public sewer system required several new railroad bridges to be built. This litigation involved several cases, all of which revolved around whether the railroad or the sewage district was liable for the cost of the bridges. The Wisconsin Supreme Court found that the construction of one of the bridges in question was necessitated by the improvement and deepening of a river. The river improvement was deemed necessary by the sewage district to handle adequately the increasing drainage of surface water which had been causing district sanitary sewers to overflow. Nevertheless, the sewage district contended that the railroad was liable for the bridge costs because of a contract in which the railroad agreed to maintain the watercourse. The Court rejected the contention, however, holding that the contract required the railroad only to return the watercourse to a useful condition. The court found the railroad liable for the cost of the other bridge, however, since the original bridge was obstructing the navigation of the watercourse. In so holding the court relied on a common law duty making railroads responsible at their own expense for meeting changes in watercourses. (Hoffman-Florida)
W76-06846

SUSSEX V. DEPT. OF NATURAL RESOURCES (ABSENCE OF SAFE MUNICIPAL WATER SUPPLY A NUISANCE).
228 NW 2d 173-80 (Wisc. 1975). 8 p.

Descriptors: *Water wells, *Wisconsin, *Water supply, *Water resources development, *Public health, Human diseases, Potable water, Safety, Water purification, Water quality, Social aspects, Wells, Well regulation, Water sources, Water resources, Water rights.
Identifiers: Police power.

Appellant village had been ordered by the Department of Natural Resources to construct a public water system. The Department had found that the absence of a municipal water system created a nuisance and menace to the health of the community. After the circuit court upheld the Department's order, the village appealed to the Wisconsin Supreme Court. The village put forth the following contentions: the state statute did not give the Department the authority to order the construction of a public water system; even if the statute did grant the Department such authority, another statute required a referendum by the electorate before the village could finance such a project; and the portion of the order requiring the sealing of contaminated private wells constituted an illegal taking of property without compensation. The Court rejected all these contentions, however, finding that the Department's order was valid and binding. The court found that the statute clearly gave the Department the authority to issue such an order if the health of the community was threatened and that this valid exercise of the state police power overrode any possible conflict with other state statutes. Finally, the court held that the village lacked standing to question the portion of the order pertaining to the sealing of the private wells. (Hoffman-Florida)
W76-06847

SWEETWATER DEVELOP CORPORATION V SCHUBERT RANCHES, INC. (APPROPRIATION RIGHTS IN DEVELOPED WATER).
535 P2d 215-19 (Colo. 1975).

Descriptors: *Jurisdiction, *Colorado, *Groundwater basins, *Water rights, *Watersheds(Basins), Wells, Adjudication procedure, Decision making, Groundwater mining, Water wells, Prior appropriation, Preferences(Water rights), Administrative agencies, Legal aspects, Judicial decisions.
Identifiers: Water rights(Non-riparians).

Plaintiff developer sought conditional decrees as to well water rights in a supplementary water adjudication proceeding. After both parties filed claims and presented proofs but before entry or decree the state ground water commission designated and created a 'designated ground water basin'. Subsequently the district court entered conditional decrees in favor of the plaintiff. On appeal the defendant challanged the jurisdiction of the district court to enter the decrees on the basis that the decrees embraced water located in a 'designated ground water basin' and that excessive jurisdiction over waters in such a basin vested in the ground water commission at the time of designation and creation. The Colorado Supreme Court upheld the district court jurisdiction. Under Colorado statutes a court can complete an adjudication proceeding involving a conditional water right if (1) prior to the designation and creation of the designated ground water basin the claim for conditional water rights has been filed and if (2) before or after designation and creation of the basin proof is introduced proving the applicant was entitled to a conditional decree prior to designation and creation of the basin. (Comer-Florida)
W76-06848

WARREN SAND AND GRAVEL CO, INC V COMMONWEALTH DEPT OF DEPT OF ENVIRONMENTAL RESOURCES (DREDGING OF BED OF RIVER FOR SAND AND GRAVEL).
341 A2d 556-566 (Pa Cmwlth 1975). 11p.

Descriptors: *Gravels, *Pennsylvania, *Dredging, *Administrative agencies, *Jurisdiction, State governments, Adjudication procedure, Permits, Regulation, Water rights, Legal review, Water law, Water permits, Economics, Economic input, Water quality, Water quality control, Environmental effects, Mineral industry, Sediments, Sands, Earth materials.

Three gravel companies and the Department of Environmental Resources (DER) brought cross-appeals from an Environmental Hearing Board's order granting permits to the gravel companies allowing them to remove sand and gravel from river beds. The orders prohibited dredging into natural and untouched areas except for certain specified areas. The gravel companies contended that the findings of the Board were not supported by substantial evidence and that the Board had improperly placed the burden of proof on them. DER argued that the Board had no authority to amend the original DER order and allow dredging in specified new areas. The Commonwealth Court of Pennsylvania held that the gravel companies had the burden of proving before the Board that the DER restrictions were unreasonable or unlawful and that the companies had not met this burden of proof. The court further held that the Board had the authority to modify discretionary decisions of DER and, therefore, had the authority to allow the dredging in the new areas. The Board's order was affirmed. (Nursey-Florida)
W76-06849

WOOD V. GIBSON CONSTRUCTION COMPANY, INC. (INCREASED DRAINAGE INTO ADJACENT PROPERTY).
313 So2d P. 898-901 (La. App. 1975). 4 p.

Descriptors: *Louisiana, *Drainage systems, *Drainage effects, *Judicial decisions, Legal aspects, Controlled drainage, Drainage water, Subsurface drainage, Water control, Civil law, Penalties(Legal), Water law, State governments, Legislation, Ditches, Drainage engineering, Water conveyance.
Identifiers: *Injunction(Mandatory), *Louisiana Civil Code Article 660.

Plaintiff homeowner brought action against defendant subdivision developer seeking an injunction to compel defendant to prevent unnatural drainage onto plaintiff's property. Plaintiff contended that drainage from the subdivision was flooding his land. Defendant contended that the subdivision development had not increased the total volume of water draining onto plaintiff's property, that the flooding of plaintiff's property had been corrected and that, in any event, plaintiff would not suffer irreparable damage. The Second Circuit Court of Appeal of Louisiana held that under Louisiana law, a servitude belongs to the estate situated below with the right to receive the water which runs naturally from the estate situated above and the owner of the higher property may take action to concentrate and speed the flow of water as long as such action does not increase the quantity of water flow. There was no evidence that defendant increased the quantity of water draining onto plaintiff's land. The court also held that since defendant had reduced the extent of flooding and the addition of greenery in the subdivision will further reduce flooding, plaintiff would suffer no irreparable damage, and therefore, no injunction should be issued. (Nursey-Florida)
W76-06850

FLA. E. COAST RY. CO. V. UNITED STATES (U.S. FLOOD DAMAGE IMMUNITY UNREPEALED BY U.S. TORT CLAIMS ACT).
519 F2d 1184-99 (5th Cir. 1975). 16 p, 1 append.

Descriptors: *Overflow, *United States, *Judicial decisions, *Flood control, *Negligence, Legal aspects, Water law, Federal government, Federal jurisdiction, Water control, Water management(Applied), Flood damage, Floods, Flood routing, Flow control, Overflow, Flood protection, Legislation.
Identifiers: Sovereign immunity, Federal Torts Claim Act, *Flood Control Act of 1948, Liability(Legal).

Plaintiff railway company brought an action against the United States Government for damage to railroad tracks located near a Government flood control project. Plaintiff contended that the damage caused by floodwaters resulted from negligent design in the flood control system which allowed a washout to occur. Plaintiff further contended that the Government was liable for damage resulting from this negligence under the Federal Torts Claims Act. The Government contended that it was immune from liability under the immunity provisions of federal flood control legislation. The Fifth Circuit Court of Appeals held that the Federal Torts Claim Act which removed federal Governmental immunity from tort liability did not impliedly repeal the immunity provisions of federal flood control legislation. Thus under this still valid legislation, the Government was immune from liability to plaintiff for the flood damage. (Nursey-Florida)
W76-06851

MOWRER V. ASHLAND OIL AND REF. CO. (ASSESSMENT OF DAMAGES FOR OIL CO'S WATERFLOOD OPERATION).
518 F2d 659-62 (7th Cir. 1975). 4 p.

Descriptors: *Injection wells, *Damages, *United States, *Judicial decisions, *Flooding, Legal aspects, Penalties(Legal), Water law, Federal jurisdiction, Injection, Oil reservoirs, Secondary recovery(Oil), Adjacent land owners, Oil, Groundwater.
Identifiers: *Nuisance(Legal aspects).

Plaintiff landowner brought a private nuisance action against defendant oil company for damage allegedly caused to plaintiff's land by defendant's waterflood operations. Plaintiff contended that defendant injected salt water at high pressure into defendant's adjacent land causing oil to seep out of a capped well on plaintiff's land. Defendant argued that it was not liable since it was lawfully conducting the waterflood operations in a reasonable and non-negligent manner. The Seventh Circuit Court of Appeals held that the waterflood opera-

tions constituted an actionable private nuisance for which neither the lawfulness of the operations nor lack of negligence could constitute a defense. (Nursey-Florida)
W76-06852

IN RE CF&I STEEL CORP (ABANDONMENT OF WATER RIGHTS).
515 P2d 456-459 (Colo 1973).

Descriptors: *Judicial decisions, *Water rights, *Colorado, Legal aspects, Water law, State governments, Economics, Economic evaluation, Legal review, Mining, Coal mines, Water demand, Mineral industry.
Identifiers: *Water rights(Non-riparian), *Abandonment(Water rights).

Plaintiff coal mine operator company brought this action to change the points of diversion of certain decreed water rights. The Company had not used these water rights for over fifty years. The trial court held that this extended period of non-use constituted an abandonment of the water rights by the plaintiff. On appeal the company contended that its non-use was excusable under Colorado law since practical and economic factors had required that the use of the water rights be discontinued. The Colorado Supreme Court disagreed, holding that an unreasonable period of non-use creates a presumption of abandonment of water rights and that economic factors requiring the discontinuance of use do not constitute a satisfactory excuse to rebut that presumption. (Nursey-Florida)
W76-06853

BAKER V ORE-IDA FOODS, INC. (ILLEGAL MINING OF AQUIFER UNDER GROUND WATER ACT).
513 P2d 627-637 (Idaho 1973).

Descriptors: *Recharge, *Idaho, *Judicial decisions, *Groundwater mining, *Aquifers, Water rights, Legal aspects, Water law, Legislation, State governments, Water supply, Water utilization, Pumping, Water wells, Groundwater, Withdrawal, Groundwater resources, Water levels, Water conservation penalties(Legal), Water management(Applied).
Identifiers: *Idaho Ground Water Act, Injunctive relief.

Plaintiff groundwater appropriators brought an action against defendant junior groundwater appropriators to enjoin defendants from pumping water from a groundwater aquifer underlying both parties' lands. Plaintiffs contended that defendants were pumping water from the aquifer at a rate greater than the aquifer's recharge rate thereby lowering the water level in the aquifer. The Idaho Supreme Court held that pumping water at a rate which would decrease the water level in the aquifer constituted a 'mining' of the aquifer forbidden by the Idaho Ground Water Act. The court held further that injunction was the proper legal remedy where pumping by defendant was resulting in withdrawals of water from the aquifer at a rate greater than the anticipated recharge rate. (Nursey-Florida)
W76-06854

TYLER V VAN AELST (WATER RIGHT IN CREEK, SUFFICIENT LEGAL RIGHT FOR PERMANENT INJUNCTION AGAINST DISTURBANCE OF CREEK BOTTOM).
512 P2d 760-763 (Wash Ct App 1973).

Descriptors: *Silting, *Adjacent land owners, *Land clearing, *Washington, *Judicial decisions, Water rights, Penalties(Legal), Legal aspects, Diversion, Water utilization, State governments, Water pollution sources, Water pollution effects, Water pollution abatement, Water quality, Water quality control, Land development.
Identifiers: *Injunctive relief.

Plaintiff owners of a water diversion system sought damages and injunctive relief against defendant adjacent land owner. The plaintiffs contended that the defendant's land clearing operations were muddying a creek upstream from their diversion system, and that mud and debris dislodged by the defendant's actions had damaged some of their diversion equipment. The defendant contended that the system owners had not shown damage to a clear legal or equitable right and, therefore, were not entitled to injunctive relief. The Washington Court of Appeals held that the plaintiffs had been granted water rights in the affected creek and that the present disturbance of the creek was only one in a chain of events calculated to disturb those water rights. The court further held that since the record showed a definite possibility that injury would occur to the plaintiffs in the future, injunctive relief was an appropriate remedy. (Nursey-Florida)
W76-06855

HOFF V. EHRLICH (DOMINANT ESTATE'S RIGHT TO DRAINAGE EASEMENT FOR NATURAL AND WASTE WATER ACROSS SERVIENT ESTATE).
511 P2d 523-526 (Colo. Ct. App. 1973).

Descriptors: *Colorado, *Judicial decisions, *Drainage, *Easements, *Surface runoff, Legal aspects, Water law, Water rights, State governments, Adjacent land owners, Penalties(Legal), Drainage, Oysters, Drainage water, Waste water, Natural flow, Running waters, Runoff, Drainage effects, Ditches, Flow.
Identifiers: *Injunctive relief.

Plaintiff dominant estate owners brought an action against defendant servient estate owner to enjoin actions of the defendant which interfered with the natural drainage of water from plaintiffs' land through defendant's land. Defendant contended that he was suffering damage from plaintiffs' waste water and was justified in acting to protect his land by controlling the water flow thereto. The Colorado Court of Appeals held that the plaintiffs had a legal easement over defendant's land for the drainage of surface water flowing in its natural manner. While defendant could take steps to protect his land, he could not cause damage to the plaintiffs by interference with the natural and waste water drain in its natural flow. Finally the court found that injunctive relief was the appropriate legal remedy to prevent the defendant's interference with such flow. (Nursey-Florida)
W76-06856

JACOBUCCI V. DISTRICT CT. IN AND FOR JEFFERSON COUNTY (RIGHTS OF SHAREHOLDERS IN MUTUAL DITCH COMPANY).
541 P2d 667-76 (Colo. 1975). 10 p.

Descriptors: *Colorado, *Condemnation, *Ditches, *Distribution systems, *Water management(Applied), Legal aspects, Judicial decisions, Conveyance, Structures, Water rights, Water contracts, Water law, Water supply, Water conveyance.
Identifiers: *Mutual ditch companies, Indispensable parties.

Petitioner stockholders filed a motion to intervene as defendants in a condemnation suit by the City of Thornton against Farmers Reservoir and Irrigation Company, a mutual ditch company. After this motion was denied, the stockholders petitioned the Colorado Supreme Court. The main issue faced by the Court was whether Farmers' stockholders were indispensable parties to the action. The city premised its contention that they were not on two theories: (1) the position of the shareholders was similar to the positions of stockholders of other companies, and, under corporation law, the company protects the shareholders interest; and (2) the company is acting as a trustee for the benefit of the shareholders. The Court disagreed, finding that shareholders of mutual ditch companies are not similar to other shareholders since mutual companies are formed for the purpose of furnishing water to shareholders and not for profit or hire. Shares of stock in a mutual ditch company, therefore, represent ownership of specific water rights, thus making the shareholders real parties in interest. The Court also rejected the agency theory since the water rights vested in the shareholders, not the company. The petitioners then were allowed to intervene. (Hoffman-Florida)
W76-06857

BAUSCH V. MYERS (NONUSE OF WATER FOR IRRIGATION PURPOSES WHICH CONSTITUTES ABANDONMENT).
541 P2d 817-19 (Ore. 1975). 3p.

Descriptors: *Oregon, *Water rights, *Irrigation water, *Priorities, *Preferences(Water rights), Appropriation, Judicial decisions, Legal aspects, Contracts, Water allocation(Policy), Beneficial use, State jurisdiction, Water law, Water policy, Prior appropriations, Irrigation permits.
Identifiers: Forfeiture(Water rights).

Plaintiff purchasers brought an action against defendant former ranchowner for fraudulently representing that the ranch had specified water rights to irrigate 27 acres, with the inception of these rights dating back to 1950. In western states the date of acquisition of water rights is important since 'early rights' are the last to be curtailed when necessity arises to restrict the use of water. After the sale was consummated, the plaintiffs learned that the state was in the process of cancelling water rights for 20.4 acres because of non-use. After the cancellation the plaintiffs reobtained the rights, but with a purchase date of 1972. This put them first in line if any water curtailment was necessitated. The plaintiffs contended that the defendant was liable for fraudulent misrepresentation by not informing them that the water rights were subject to forfeiture. The trial court dismissed the complaint, however, finding that the defendant had acted by mistake rather than recklessly. In reversing, the Oregon Supreme Court found that the forfeiture of water rights was common knowledge in Oregon. Thus, the failure of defendant to so advise the plaintiffs constituted reckless conduct, making defendant liable for any damages suffered by the plaintiffs. (Hoffman-Florida)
W76-06858

METRO PARK DISTRICT V. STATE DEPARTMENT OF NATURAL RESOURCES (GRANTING OF STATE OWNED TIDELANDS NOT ULTRA VIRES).
539 P2d 854-63 (Wash. 1975). 10p.

Descriptors: *Washington, *Wetlands, *Leases, *Land tenure, *Judicial decisions, Legal aspects, Land use, Real property, Management, Terrestrial habitats, Aquatic environments, Land reclamation, Contracts.
Identifiers: *Land use deeds.

After preliminary negotiations, plaintiff State divided newly created tidelands into three tracts, selling two of them to the defendant park district and granting a use deed to the district for the other tract. After this transaction was completed, the district leased tidelands supposedly in the purchased tracts to a yacht club to build a new clubhouse. After clubhouse construction began, it was determined that the clubhouse was partly situated on the use deed tract. Because the clubhouse facility did not comply with applicable state statutes, the State brought this action to cancel the use deed. Following judgement for the district, the State appealed, contending that the alleged statutory violations by the yacht club were grounds for cancelling the use deed. The State also contended that the granting of the deed by the State Commission for an unauthorized project was an ultra vires

act, and thus void. The Washington Supreme Court disagreed, however, finding that the Commission was legally authorized to issue the deeds. The Court also found that the State was equitably estopped from asserting statutory violations as grounds for the deed cancellation, since the State had actual or constructive knowledge that the district was going to lease the land to the yacht club. (Hoffman-Florida)
W76-06859

PARKE V. BELL (PERFECTION OF WATER RIGHT BY DIVERSION OF SPRING GIVES LAND BENEFITTED AN INTEREST WHICH IS UNAFFECTED BY SUBSEQUENT CONVEYANCE OF LAND ON WHICH SPRING IS LOCATED),
539 P2d 995-99 (Idaho 1975). 5p.

Descriptors: *Idaho, *Ditches, *Spring waters, *Appropriation, *Easements, Maintenance, Water sources, Water rights, Beneficial use, Judicial decisions, Legal aspects, Penalties(Legal), Erosion, Relative rights, Water utilization, Preference(Water rights), Adjacent landowners.

Plaintiff landowners brought an action against defendant landowner for damages allegedly caused to the plaintiffs' land by the defendant's failure to maintain a ditch that transversed the plaintiffs' land. The defendant counterclaimed to establish his right to the use of the water and the ditch easement. The district court entered a judgement and decree for the defendant. On appeal, the plaintiffs contended that the spring waters diverted by the defendant's ditch were private waters owned by them and not subject to appropriation. The Idaho Supreme Court disagreed, finding that the defendant's father had originally owned the land on which the spring was situated. Consequently, when he diverted the spring water to other land for a beneficial purpose, a valid appropriation had taken place and the water right perfected became appurtenant to the receiving land. Thus, the plaintiffs' later acquisition of the land on which the spring was situated did not affect the appurtenant water right in other land which had descended to the defendant. The court also rejected the plaintiffs' contention that the trial court should have awarded them damages for the erosion to their land allegedly caused by defendant's ditch, finding that insufficient evidence had been introduced to negate the possibility that the erosion was solely the result of natural conditions. (Hoffman-Florida)
W76-06860

LEGAL PROBLEMS IN THE ACQUISITION OF SUITABLE WATER SUPPLIES FOR OIL SHALE OPERATIONS IN WESTERN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Environmental and Natural Resources Law.
For primary bibliographic entry see Field 3E.
W76-06940

WATER AND THE BRITISH COLUMBIA MINING INDUSTRY,
Ker, Priestman and Associates, Ltd., Victoria, (British Columbia).
For primary bibliographic entry see Field 5G.
W76-06954

THE ROLE OF TWO MANITOBA TRIBUNALS IN ENVIRONMENTAL DECISION MAKING,
Manitoba Univ., Dept. of Civil Engineering. Winnipeg.
For primary bibliographic entry see Field 6G.
W76-07028

REPORT OF WORKING GROUP A: ENVIRONMENTAL DECISIONS ON MAJOR PROJECTS.
For primary bibliographic entry see Field 6G.
W76-07029

CONFLICT AND COALITION: POLITICAL VARIABLES UNDERLYING WATER RESOURCE DEVELOPMENT IN THE UPPER COLORADO RIVER BASIN,
California Univ., Santa Barbara. Dept. of Political Science.
For primary bibliographic entry see Field 4A.
W76-07109

ENVIRONMENTAL IMPLICATIONS OF RIVER BASIN DEVELOPMENT INCLUDING WATER QUALITY MANAGEMENT: GENERAL REPORT,
Fordham Univ. Bronx N. Y. School of Law.
For primary bibliographic entry see Field 5G.
W76-07134

LEGAL AND ADMINISTRATIVE CONTROL OF THE IMPACT OF RIVER BASIN DEVELOPMENT ON THE ENVIRONMENT,
Fordham Univ. N. Y. School of Law.
For primary bibliographic entry see Field 4A.
W76-07135

INTERBASIN TRANSFER OF WATER RESOURCES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W76-07137

THE INTEGRATED RIVER BASIN CONCEPT AND INTERNATIONAL WATER RESOURCES MANAGEMENT,
United Nations Centre for Natural Resources, Energy and Transport, New York.
For primary bibliographic entry see Field 4A.
W76-07138

MANAGING LIVESTOCK WASTES.
American Society of Agricultural Engineers, St. Joseph, Mich.
For primary bibliographic entry see Field 5D.
W76-07154

EFFECTS OF ENVIRONMENTAL LEGISLATION OF CATTLE FEEDLOT LOCATION,
Ohio State Univ., Columbia. Dept. of Industrial and Systems Engineering.
For primary bibliographic entry see Field 5G.
W76-07159

ECONOMIC IMPACTS OF IMPLEMENTING EPA WATER POLLUTION CONTROL RULES ON THE UNITED STATES BEEF FEEDING INDUSTRY,
Economic Research Service, East Lansing, Mich.
For primary bibliographic entry see Field 5G.
W76-07160

IMPLICATIONS OF SELECTED NON-POINT SOURCE POLLUTION REGULATIONS FOR U.S. DAIRY FARMS,
Minnesota Univ., St. Paul.
For primary bibliographic entry see Field 5G.
W76-07162

FEEDLOT EFFLUENT LIMITATIONS BASED UPON EXEMPLARY OPERATIONS,
Environmental Protection Agency, Washington, D.C. Impact Analysis Agency.
For primary bibliographic entry see Field 5G.
W76-07163

PARTNERSHIP IN POLLUTION CONTROL,
Illinois Pollution Control Board, Chicago.
For primary bibliographic entry see Field 5G.
W76-07164

THE NPDES DISCHARGE PERMIT PROGRAM FOR AGRICULTURAL POINT SOURCES,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-07165

NEBRASKA FLOOD-PLAIN MANAGEMENT PROGRAM--PART I,
Nebraska Natural Resources Commission, Lincoln. Flood Plain Management Section.
For primary bibliographic entry see Field 6F.
W76-07215

NEBRASKA FLOOD-PLAIN MANAGEMENT PROGRAM--PART II,
Nebraska Natural Resources Commission, Lincoln.
For primary bibliographic entry see Field 6F.
W76-07216

LEGAL PERSPECTIVE ON WATER QUALITY MANAGEMENT,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 5G.
W76-07221

PROBLEMS UNDER STATE WATER LAWS: CHANGES IN EXISTING WATER RIGHTS,
Colorado State Univ., Fort Collins.
M. D. White.
Natural Resources Lawyer, Vol. 8, No. 2 p. 359-76 (1975). 17 p. OWRT C-6076 (No. 5211)(1).

Descriptors: *Project feasibility, *Water resources development, *Water demand, *Water rights, *Energy, Diversion, Storage, Permits, Appropriation, Consumptive use, Irrigation, Water quality, Downstream, Streams, Reservoirs, Effluents, Jurisdiction, Beneficial use, Navigable waters, Land use.
Identifiers: Navigation servitudes, Compensatory water, Ditch company.

Changing existing water rights for energy development is a difficult undertaking and should be considered only when it is impossible to initiate a new water right. Statuatory prohibitions and self-imposed restructions to water right changes must be considered intially. Then the traditional legal rule is that no right may be changed that will result in injury to others. Possible injuries to water rights themselves include changes in consumptive use, historic use, timing of diversions and return flow, water quality, minimum and maximum stream flows and municipal return flows. Also to be considered in attempting a change of water rights are abandonment and forfeiture statutes, federal reservations, anti-export statutes, the problems of appraisal and conveyancing, navigation servitudes, and interstate stream compacts. State environmental statutes and regulations, such as the 1972 Amendments to the Federal Water Pollution Control Act, the 1970 Clean Air Act, the Safe Drinking Water Act, and the National Environmental Policy Act, should be considered as well. Finally, and perhaps most importantly, land use controls should be carefully studied. (Segall-Florida)
W76-07233

PERSPECTIVES ON OCEAN POLICY; CONFERENCE ON CONFLICT AND ORDER IN OCEAN RELATIONS, AIRLIE, VA., OCTOBER 21-24, 1974.
Johns Hopkins Univ., Washington, D. C. School of Advanced International Studies.
National Science Foundation, 1975. 435 p, 2 fig, 3 dwg, 7 tab, 1 append.

Descriptors: *Oceans, *Water policy, *Law of the sea, *Political aspects, *Foreign countries, Politi-

cal constraints, Research and development, Analytical techniques, Grants, Projects, Negotiations, Foreign waters, United States, Comprehensive planning, International waters, International joint commissions.
Identifiers: *Ocean regime.

To encourage the creation of a comprehensive ocean regime, the Ocean Policy Project was established by the National Science Foundation. Its purpose is to synthesize and analyze various aspects of the new era of ocean politics. Once this step is completed the Project will relate its findings to the various ocean policy options available to the United States. This pursuit of an international treaty covering complex law of the sea issues acceptable to both the United States and foreign nations constitute a unique experiment. While the political structure of the United States may impair the chances of the enactment of such a treaty, it has at least demonstrated that a global perspective is necessary to insure the formulation of a treaty that will adequately protect common community interests. In the author's opinion such a recognition is an essential first step to an effective ocean regime. (See W76-07331 thru W76-07351) (Hoffman-Florida)
W76-07330

THE CARACAS SESSION IN REVIEW: REMARKS ON THE SECOND SESSION OF THE THIRD LAW OF THE SEA CONFERENCE,
J. R. Stevenson.
In: Perspectives on Ocean Policy, p 7-11, National Science Foundation, 1975.

Descriptors: *Law of the sea, *Treaties, *International waters, *International law, *Exploitation, Mineralogy, International commissions, Water resources, Jurisdiction, Economics, Water resources development, United States, Foreign countries, Mining.
Identifiers: Developing countries.

One of the major benefits of the Third Law of the Sea Conference was the drafting of several treaty texts which presented various alternatives in balancing the rights and duties of coastal states pertaining to territorial seas and economic zones. These tests, which were concerned with specific problems, will provide a working paper that should allow for more rapid progress in resolving disagreements. This will be especially true concerning the deep seabed and mineral exploitation draft treaty since it was in this area where the best technical preparation had taken place prior to the Conference. Possibly because of this preparation, there were significant movements by some of the developing countries concerning the exploitation issue. While these countries had previously rejected proposals that would have placed conditions with respect to exploitation, they submitted a draft which would allow a treaty to set basic exploitation conditions. In addition, the draft contemplated the possibility of giving outsiders contractual rights to exploitation, thus reversing the previous stand of the developing countries that called for the International Authority to have monopolistic powers. Although there is still a considerable gulf between the position of the developing and industrial countries relating to deepsea mineral exploitation, the draft texts submitted at the Conference show that there is some flexibility in their positions. (See also W76-07330) (Hoffman-Florida)
W76-07331

THE ROLE OF FORCE IN THE OCEAN,
Kings College, London (England).
L. Martin.
In: Perspectives on Ocean Policy, p 33-44, National Science Foundation, 1975.

Descriptors: *Right-of-way, *Military aspects, *Law of the sea, *Navigation, *Foreign countries, Submarines, Beds, Oceans, Exploitation, Transportation, Ships, Straits, Inland waterways, Bodies of water, International law, International commissions.
Identifiers: Right of passage, Naval operations, Ships(Military).

Although much of the discussion concerning ocean law changes has centered around economic and conservation considerations, there has been speculation as to what effect ocean law changes will have on the future of naval operations. For instance, it is now generally accepted that countries may situate military equipment, except for weapons of mass destruction, on the ocean seabed. Thus, if ocean treaties allocating specific exploitation rights to specific countries in the deep seabed are ratified, serious confrontations could develop between countries having military equipment in an area and countries having exploitation rights in that same area. Potential confrontations could also result if the territorial sea zones are extended. Because of the importance of sea transportation to many countries, it is conceivable that coastal countries might refuse to allow the passage of ships necessary for the prosperity or existence of a hostile state. The coastal states could also refuse to allow the passage of naval warships through their territorial seas. Such power would be especially significant in areas such as the Straits of Tiran where territorial jurisdiction could effectively limit naval entry and operations. Because such limitations and changes could have damaging effects, it is probable that military considerations will play a large role in drafting any future changes in ocean law. (See also W76-07330) (Hoffman-Florida)
W76-07332

COMMENTARY ON THE ROLE OF FORCE IN THE OCEAN,
L. Wells, II.
In: Perspectives on Ocean Policy, p 45-53, National Science Foundation, 1975.

Descriptors: *Military aspects, *International waters, *Political aspects, *International law, *Navigation, Negotiations, Water policy, Decision making, Foreign countries, Right-of-way, Coasts, United States, Ships, Comprehensive planning, Law of the sea.
Identifiers: Military weapons, Naval forces, Coastal states.

Because of fundamental changes in our perspective of the oceans, the usefulness of naval forces in future diplomacy may be very limited. With the advent of intercontinental weapons, the existence of powerful naval forces does not present the great danger it once did. In addition, because of the recent recognition of the vast resources of the ocean, nations will actively resist infringements of their economic zones. Thus, emphasis will be placed on the effectiveness of coastal zone naval operations and not on distant water operations. There has also been a trend by the developed countries, those having the strongest naval forces, to refrain from using those forces because of political implications. Examples of such restraint are the British concessions in the Cod War, and United States inaction in the South American tuna boat disputes. Finally, the highly sophisticated military weapons now in the hands of developing coastal countries can provide ample power to challenge any military vessels in territorial waters. While these factors do not conclusively signal the end to naval influence in ocean policy decision-making, it seems probable that the freedom of naval mobility will be significantly reduced in the future. (See also W76-07330) (Hoffman-Florida)
W76-07333

REGIONAL APPROACHES TO LAW OF THE SEA: THE EUROPEAN COMMUNITY,
M. Hardy.
In: Perspectives on Ocean Policy, p 61-74, National Science Foundation, 1975.

Descriptors: *International law, *Law of the sea, *Regional development, *United Nations, *Political aspects, Treaties, Water policy, Water law, Negotiations, Regional analysis, Foreign countries, Water resources development, Oceans, United States, International commissions.
Identifiers: Regional approach, European Economic Community.

Considerable discussion has centered around the question of whether a 'regional approach' should be adopted by the Conference on the Law of the Sea in attempting to reach agreement on various issues pertaining to the oceans. The essence of the 'regional approach' is that problems pertaining to ocean law should be settled on an area-by-area, ocean-by-ocean approach, instead of a single treaty presenting various solutions to be applied to all ocean areas in the world. Thus, a 'regional approach' conceivably could find that territorial zones should extend farther for Atlantic Ocean coastal states than for Pacific Ocean coastal states. Presently, there appears to be two different kinds of regional approaches. One kind consists of the use of United Nations regional groupings to pursue goals that are widely shared by other members. The other kind involves a wider process of regional integration, the primary example being the European Economic Community (EEC). The EEC is analyzed to show what benefits can be derived from such an approach and to show how its organizational decision-making differs from the first type of regional approach. (See also W76-07330) (Hoffman-Florida)
W76-07334

REGIONAL APPROACHES TO LAW OF THE SEA: LATIN AMERICA,
University of Chile, Santiago.
F. O. Vicuna.
In: Perspectives on Ocean Policy, p 75-86, National Science Foundation, 1975.

Descriptors: *International waters, *Jurisdiction, *International law, *Foreign countries, *Water resources, Mineralogy, Navigation, Commercial fishing, Mexico, Water pollution, Beds, Coasts, International commissions, Oceans, Political aspects, Water policy, Law enforcement.
Identifiers: Territorial sea, Coastal states, Economic zones, Latin America.

Although Latin American countries agree that they should have control over resources within a 200-mile zone from their coast, they and most other states disagree over what power coastal states should exert over these areas. Several countries, including Brazil and Peru, contend that the 200-mile zone is a territorial sea, while other countries, including Mexico, Chile and Argentina, contend that the territorial sea extends only 12 miles, the rest being an economic zone. These two positions have significant differences, since powers over a territorial sea are far greater than those over an economic zone, and encompass the authority to regulate and control navigation and overflight. The Latin American countries are in agreement, however, that all living and mineral resources within the 200-mile zone are to be controlled by the coastal states, irrespective of the geological characteristics of the seabed; furthermore, the coastal states have the jurisdiction to control marine pollution within the 200-mile zone. Because the countries are in agreement on many basic issues, their resolution of the territorial sea dispute could provide a useful insight into arranging other international compromise agreements. However, more than mere agreements among the Latin American countries will be needed, since the interests of other nations, especially commercial fishing nations, will have to be considered in reaching any lasting agreement. (See also W76-07330) (Hoffman-Florida)
W76-07335

REGIONAL APPROACHES TO LAW OF THE SEA: AFRICA,
F. X. Njenja.
In: Perspectives on Ocean Policy, p 87-105, National Science Foundation 1975.

Descriptors: *International waters, *International law, *Jurisdiction, *Coasts, *Foreign countries, Navigation, Water pollution, Straits, Exploitation, Continental shelf, Political aspects, Oceans, Water policy, Law of the sea, *Africa.
Identifiers: Landlocked countries, Coastal states, Territorial sea, Economic zone.

The African delegation to the Law of the Sea Conference consists of forty-one countries. Because of this large number, and because thirteen of those countries are landlocked, there is a wide divergence of interests among the delegation. Nevertheless, the African countries are firmly united on two issues: (1) that to insure the unhampered right of navigation for commercial trade the African countries should have jurisdiction over bordering straits; and (2) that to prevent harmful pollution from ships in the super tanker route around Africa, the African countries should have pollution control jurisdiction over all ships within their national jurisdiction. Beyond these two issues, however, there is considerable disagreement. For instance, twelve of the coastal states claim a twelve-mile territorial sea, while the others claim territorial seas ranging from eighteen to two hundred miles. It is too early to tell if these different territorial sea zones will prevent a general uniform law concerning powers of jurisdiction since it is conceivable that some countries may exercise varying degrees of control over areas within their territorial jurisdiction. Other areas of African disagreement center around jurisdictional controls over the economic zone and the continental shelf, and around the rights of landlocked countries in the exploitation of the ocean. (See also W76-07330) (Hoffman-Florida)
W76-07336

THE NORTH-SOUTH SPLIT AND THE LAW OF THE SEA DEBATE,
Overseas Development Council, Washington, D.C.
R. D. Hansen.
In: Perspectives on Ocean Policy, p 109-134, National Science Foundation 1975.

Descriptors: *Law of the sea, *International law, *Political aspects, *Foreign countries, *Treaties, Economics, Economic impact, Continental shelf, Water resources, Political aspects, Oceans, Water policy, Exploitation, Coasts, Navigation.
Identifiers: Developing countries, Developed countries, Landlocked countries, Economic zones, Territorial seas, Coastal states.

When economic interests are examined, it would appear that a clean North-South split at the upcoming law of the sea conference is unlikely. While the developing and developed countries would both like to maximize their gains, there is a significant disagreement within each bloc on vital law of the sea issues. For instance, landlocked countries of the northern bloc generally want territorial seas and economic zones to be limited. The northern coastal states, however, have made it clear that an expansive economic zone is a top priority. As to the southern bloc, there is considerable internal disagreement over such issues as continental shelf jurisdiction, 'Seabed Authority' powers, and the economic rights of landlocked countries. Nevertheless, it has been suggested that any final treaty will have to be acceptable to all of the developing countries. Such a viewpoint seems to have been correct as to the Caracas session of the Conference. There the southern bloc stalled on all serious negotiations on major issues because they had been unable to achieve internal agreement. This desire for solidarity was best exemplified by southern support of OPEC oil price increases, despite the devastating effect of those increases on some southern countries. Whether this southern desire for solidarity can overcome basic economic differences is a question that remains unanswered. (See also W76-07330) (Hoffman-Florida)
W76-07337

COMMENTARY ON THE NORTH-SOUTH SPLIT AND THE LAW OF THE SEA DEBATE,
Department of State, Washington, D.C. Office of the Assistant Legal Adviser for Ocean Affairs.
T. Leitzell.
In: Perspectives on Ocean Policy, p 134-138, National Science Foundation, 1975.

Descriptors: *Negotiations, *Water policy, *Law of the Sea, *International law, *Political constraints, Institutional constraints, Economic impact, Environmental control, Treaties, Political aspects, Water resources development, Jurisdiction, Foreign countries, Oceans.
Identifiers: Bloc negotiations, Developing countries, Economic zones.

Bloc negotiations have often proved to be a stumbling block to the successful formulation of international agreements. Because most nations are acting in their own national economic interests, however, the Law of the Sea Conference has not been characterized by such East-West or North-South splits. Possibly this lack of a distinct split has been because the Soviet Union and the United States have adopted similar stands on a number of issues. Whatever the reason, it now appears that most issue disagreement has been the result of economic considerations. For instance, the developing countries have been more concerned with restrictions on economic development than with provisions relating to environmental protection. Their position has shifted during negotiations, however, as they realize that environmental protection will also ultimately benefit them. The developed countries have also had some shifting positions as emphasis has been placed on the real interests of opposing sides rather than on bloc politics. Acceptance of a 200-mile economic zone by the developed countries, who had previously resisted such a concept, is a prime example of putting real economics ahead of politics. While difficult and complex issues remain to be resolved, the chances of enacting a successful treaty appear good if bloc positions on politicized issues can be avoided. (See also W76-07330) (Hoffman-Florida)
W76-07338

ENVIRONMENTAL POLICY AND THE OCEAN,
Johns Hopkins Univ., Washington, D.C. School of Advanced International Studies.
C. S. Pearson.
In: Perspectives on Ocean Policy, p 207-219, National Science Foundation 1975.

Descriptors: *International waters, *International law, *Oceans, *Water pollution control, *Compensatory payment, Waste disposal, Administration, Economics, Cost-benefit analysis, Ships, Navigation, Water quality standards, Foreign countries, Political aspects, International commissions.
Identifiers: Ocean Dumping Convention, Convention on the Prevention of Pollution from Ships, *Ocean dumping.

Two recent conventions on marine pollution, the Ocean Dumping Convention and the Convention on the Prevention of Pollution from Ships, have addressed the question of whether international agreements can be reached pertaining to the enactment of pollution control measures stringent enough to protect the ocean environment. The greatest stumling block to such an agreement has been a reluctance on the part of countries to unilaterally limit ocean waste disposal without assurance that other countries will take the same action. The key to encouraging such unilateral pollution abatement could possibly come from an international agreement calling for international compensation for damages caused by ocean pollution. Because such a proposal would be difficult to administer and enforce, the Ocean Dumping Convention makes no mention of pollution compensation. Instead, it gives individual countries wide discretion in establishing ocean dumping criteria so that a beneficial cost-benefit result can be maintained. The Pollution from Ships Convention on the other hand, while also ignoring compensation provisions, is not nearly so general, and presents specific provisions pertaining to equipment and operating instructions. Whether such provisions will be effective in the absence of a compensation mechanism remains to be seen. (See also W76-07330) (Hoffman-Florida)
W76-07339

ALTERNATIVE APPROACHES TO ORDER: TREATY AND NON-TREATY APPROACHES TO ORDER IN THE WORLD OCEAN,
Louisiana State Univ., Baton Rouge. Law School.
H. G. Knight.
In: Perspectives on Ocean Policy, p 251-272, National Science Foundation 1975.

Descriptors: *Exploitation, *Water resources, *International law, Oceans, *Political aspects, Political constraints, Legislation, Law of the sea, Fisheries, Fish management, Fish conservation, Mining, Water pollution, Water resources development, Foreign countries.
Identifiers: *Deepwater ports.

To prevent conflicts over exploitation rights pertaining to the ocean's resources nations of the world are attempting to draft an agreement on law of the sea issues which will have world-wide acceptance. Because of numerous factors, however, it is unlikely that such an agreement will be reached at the upcoming Law of the Sea Conference. Some of these factors include: the leak of a single draft; the size and complexity of the Conference; the 'package deal' and 'gentleman's agreement' approach; the lack of political decisions; and the existence of political orientation. Because of the probable failure of the Conference, it is suggested that the United States adopt domestic legislation on a wide number of law of the sea issues which will protect national interests but which will also set a legislative example to be followed by other countries. For instance, on the issue of fisheries management and jurisdiction, legislation could be enacted that would provide for the protection of coastal species of fish while at the same time minimizing potential international conflicts over acceptable catch limits. Such legislation could also be enacted pertaining to seabed mining, deepwater ports, and pollution. While such legislation will not solve all problems, it will help provide a basis for future international negotiations. (See also W76-07330) (Hoffman-Florida)
W76-07340

ALTERNATE APPROACHES TO ORDER: INTERNATIONAL OCEAN ORGANIZATION AND THEIR REGULATORY FUNCTIONS,
American Society of International Law, Washington, D.C.
D. A. Kay.
In: Perspectives on Ocean Policy, p 281-300, National Science Foundation 1975.

Descriptors: *Regulation, *Coordination, *International waters, *International commissions, *Fish management, Commercial fishing, Fish stocking, Fish harvest, International law, Law of the sea, Fish populations, Comprehensive planning, Foreign countries, Political aspects, International joint commissions.

Because of an increasing awareness of the wealth of the living and non-living resources of the ocean, the regulatory functions of international ocean or-

ganizations have assumed a major role in United Nations (UN) activities. Currently, however, most international regulation of fishing is achieved through regional commissions outside of the UN system. Such regulatory schemes often fail to coordinate effectively the major aspects of the fishing problem and thus often fail to meet the conflicting expectations of member nations. For example, the following regulatory problems exist concerning the fishing issue: entry into the fishery; the long term cost calculus of a common resource; control over the size of the catch; control over ship construction leading to overcapitalization; and uncertainty as to the population dynamics of the fish stock. When one organization takes steps to correct problems in one of these areas without giving consideration to the effects its decision will have on other aspects of the fishing problem and on other nations outside of the organization, the potential for future conflicts is greatly increased. Consequently, to achieve maximum results from fish regulation, some type of regulatory body should be formed which will have the authority to develop a norm creating, cost allocating regulatory system. (Hoffman-Florida)
W76-07341

COMMENTARY ON: ALTERNATE APPROACHES TO ORDER: INTERNATIONAL OCEAN ORGANIZATION AND THEIR REGULATORY FUNCTION,
South Carolina Univ., Columbia.
H. Silverstein.
In: Perspectives on Ocean Policy, p 301-307, National Science Foundation 1975.

Descriptors: *Coordination, *Organizations, *International law, *Law of the sea, *Data transmission, Administrative agencies, Water policy, Professional societies, Decision making, Administration, Foreign countries, Data storage and retrieval, Data processing, Water policy.
Identifiers: International organizations.

International organizations will play an important role in implementing international agreements pertaining to law of the sea issues. Several obstacles must be overcome, however, before such organizations can achieve their full potential. First, it is essential that there be improvement in information processing technology. The current structure provides too much information of limited usefulness and not enough information on vital issues, such as the scientific aspects of the fisheries issue. Secondly, international organizations should refrain from attempting to coordinate national programs with incompatible objectives. Most organizations are currently perceived in state-centric terms. Such a perception may no longer be valid with the development of inter-intergovernmental organizations, such as the Long-term and Expanded Program of Oceanic Research (LEPOR). Another factor leading to the obsolescence of a state-centric approach is that nations are not unified actors; i.e., they often engage in behind-the-scene efforts to block the official objectives of their delegations. Because of these factors, the roles of international organizations may need to be redefined effectively to carry out their functions. (See also W76-07330) (Hoffman-Florida)
W76-07342

COMMENTARY ON: ALTERNATE APPROACHES TO ORDER: INTERNATIONAL OCEAN ORGANIZATIONS AND THEIR REGULATORY FUNCTIONS,
American Society of International Law, Washington, D.C.
R. Stein.
In: Perspectives On Ocean Policy, p 308-311, National Science Foundation 1975.

Descriptors: *Law of the sea, *International law, *Oil pollution, *Economic impact, *Water pollution control, Exploitation, Treaties, International waters, Ships, Economics, Water quality control, Environmental control, Environmental effects, Foreign countries, Political aspects.
Identifiers: Economic zones, Environmental impact statements.

Environmental issues have generally been pushed into the background at recent international Law of the Sea Conferences. Even the issue of oil pollution by ocean vessels, an issue which has received considerable public attention, has been largely ignored as developing countries have resisted any moves to place restrictions on economic development. While several general treaty provisions have been proposed concerning vessel pollution, they have generally contained broad warnings that any pollution control measures taken must be compatible with the individual state's need for economic progress. In effect, these proposals give no guarantee of the implementation of effective pollution control measures. There have also been useful proposals presented pertaining to impact statements or environmental safeguards related to resource exploration and exploitation within economic zones. Unless specific treaty proposals are formulated on these and other environmental issues, little success on environmental issues can be expected from future Law of the Sea Conferences. (See also W76-07330) (Hoffman-Florida)
W76-07343

GEOGRAPHY AND THE LOS DEBATE: PROTECTION OF COASTAL STATE INTERESTS VERSUS THE PRESERVATION OF INTERNATIONAL INTERESTS,
Canadian Embassy, Vienna (Austria).
J. A. Beesley.
In: Perspectives on Ocean Policy, p 335-342, National Science Foundation 1975.

Descriptors: *International joint commissions, *Foreign countries, *Law of the Sea, *Fisheries, *International waters, International law, Federal jurisdiction, Commercial fish, Water law, Jurisdiction, Commercial fishing, Political aspects, Coasts, Water resources development.
Identifiers: Coastal states, Marine environment, State sovereignty.

Because few nations want total freedom or total sovereignty with respect to law of the sea issues, the possibility of international management presents a viable alternative. Such an international management would have to be developed gradually, since most international relations are based on the principle of state sovereignty. For example, most coastal states have decided that the best way to protect fishing interests off their coast is through state jurisdiction over the waters. This does not rule out the possibility, however, of an international management agreement whereby coastal rights could retain certain rights, while at the same time acquiring certain duties and responsibilities. Such an agreement, which would attempt to insure a balance between national and international interests, would help promote international cooperation by: aiding in the maintenance of peace and security; furthering the preservation and improvement of the marine environment; contributing to world economic stability; narrowing the gap between developed and developing nations; and conserving the living and non-living resources of the ocean. Before such international agreements can come into effect, though, countries must resist the impatient pressure for unilateral action. (See also W76-07330) (Hoffman-Florida)
W76-07344

COMMENT ON: GEOGRAPHY AND THE LOS DEBATE: GEOGRAPHICAL FACTORS AND THE PATTERNS OF ALIGNMENT,
Columbia Univ., New York. School of Law.
L. Henkin.
In: Perspectives on Ocean Policy, p 342-349, National Science Foundation 1975.

Descriptors: *Foreign countries, *Water resources, *International law, *Military aspects, *Law of the sea, *Water law, Economics, Water policy, Jurisdiction, Navigation, Mineralogy, Water resources development, Political aspects, Coordination, Environmental effects, Coasts.
Identifiers: Coastal states, Territorial sea, Maritime states.

The economic need for living and non-living ocean resources has exerted great pressure upon coastal states to extend their 'contiguous zone' jurisdiction. Such an expansion would have met great resistance several years ago when the traditional concepts of freedom of the seas was generally accepted. Due to significant changes in military technology, in the attitudes of maritime states, and in the political system, however, resistance to coastal state expansion has been significantly weakened. Whether this expansion will enhance national interests at the expense of international interests is a question open to much speculation. It is suggested that this expansion will have adverse effects on international relations since it increases the area for potential conflicts and may increase the potential for unjustifiable interference with foreign activities by coastal states. In addition, unilateral actions by coastal states have generally been undertaken to protect the national interest with little thought given to their effects on the international community. International agreements on contiguous zone jurisdiction, on the other hand, could provide ample protection for coastal states while at the same time minimizing potential conflicts with other nations. (See also W76-07330) (Hoffman-Florida)
W76-07345

CONGRESS AND A LAW OF THE SEA TREATY,
S. C. Pell, and E. F. Hollings.
In: Perspectives on Ocean Policy, p. 365-76, National Science Foundation 1975

Descriptors: *Foreign countries, *Law of the sea, *International waters, *International law, *Water resources development, Navigation, Fisheries, Continental shelf, Continental margin, United States, Mineralogy, International commissions, Jurisdiction, Economics, Coasts, Comprehensive planning, Treaties, Water law, Military aspects, Political aspects.
Identifiers: Coastal nations, Economic zone, Territorial sea.

The desire of the developing countries, which form a bloc called the Group of 77, to present a unified position on law of the sea issues has seriously impeded international negotiations. Consequently, if some type of international agreement can not be reached the United States should consider well-planned unilateral action on a number of important issues such as navigational freedoms, fisheries, the international sea-bed area, and the continental shelf. Regarding navigational freedoms, it is suggested that the question of access to resources by navigational means should no longer be controlled merely by military considerations, but should be judged on its own merits. In the international seabed area, a policy should be established that encourages fair access and investments in deepsea minerals and which prevents monopolistic controls by any international organization. The United States has also proposed that a 200 mile economic zone be established giving coastal states preferential fishing rights, and that coastal states be given resource jurisdiction over the continental shelf to encourage the production of oil resources. While unilateral action to enact these goals is a secondary choice to international agreement, its viability as a workable alternative should not be overlooked. (See also W76-07330) (Hoffman-Florida)
W76-07346

FUTURE PROSPECTS FOR LAW OF THE SEA: COMMENTS ON CARACAS AND PREDICTIONS FOR THE FUTURE,
Woodrow Wilson International Center for Scholars, Washington, D. C.
A. Pardo.
In: Perspectives on Ocean Policy, p. 383-405, National Science Foundation 1975.

Descriptors: *Law of the sea, *Baseline studies, *Islands, *Jurisdiction, *Coasts, Navigation, Straits, International waters, International law, Negotiations, Political aspects, Continental shelf, Water resources, Development, Foreign countries.
Identifiers: Economic zone, Territorial sea, Land locked countries, Coastal states.

Several different proposals concerning the limits of coastal state sovereignty or jurisdiction in the oceans were set forth at the Law of the Sea Conference. The first question addressed by these proposals involved the setting of baselines defining coastal state jurisdiction. On this question there was little disagreement, with the great majority of states favoring the archipelagic principles for drawing baselines. There was considerable disagreement, however, on the territorial sea or economic zone jurisdiction of islands. Under previous international law, when territorial sea jurisdiction was very narrow, it was generally thought that the marine jurisdiction of islands was determined in the same way as for large land masses. With the introduction in recent years of the 100-mile economic zone, this position has come under attack, and many nations now favor denying jurisdictional rights to foreign dominated islands lying within the economic zone of another country. Whether such a view will be adopted by the Conference is uncertain. Several other areas of disagreement at the Conference described in this article include: the nature and scope of coastal states' powers within the economic zone; ocean rights in land-locked states; and navigational rights through straits within territorial seas. (See also W76-07330) (Hoffman-Florida)
W76-07347

COMMENTARY ON: FUTURE PROSPECTS FOR LAW OF THE SEA: COMMENTS ON CARACAS AND PREDICTION FOR THE FUTURE,
Woodrow Wilson School of Public and International Affairs.
S. McIntyre.
In: Perspectives on Ocean Policy, p. 406-408, National Science Foundation 1975.

Descriptors: *Law of the sea, *International law, *Treaties, *International waters, *Foreign countries, Navigation, Straits, Military aspects, Negotiations, Water policy, Policy aspects, Water resources development, Treaties, Coordination.
Identifiers: Archipelagos, Unilateral action, Coastal states, Economic zone.

Despite the pessimism of many commentators, the desire of nations to avoid international conflict should result in a treaty at the Law of the Sea Conference. Although this treaty will probably leave several important issues unanswered, it should make an important contribution by emphasizing international action instead of unilateral action. As to specific issues, the treaty will probably define archipelagic waters in such a way as to allow the unimpeded transit of military vessels. Such a provision is not assured of passage, however, as many commentators and nations feel that advance notification will be required of military vessels seeking passage through straits. As to scientific research within the economic zone, the treaty will probably not require the consent of coastal states, despite the insistence of a bloc of states who favor such a consent regime. Whatever decisions are made on this and other issues, the Law of the Sea Conference should prove to be a stepping stone for more productive international negotiations in the future. (See also W76-07330) (Hoffman-Florida)
W76-07348

COMMENTARY ON: FUTURE PROSPECTS FOR LAW OF THE SEA: COMMENTS ON CARACAS AND PREDICTION FOR THE FUTURE,
R. Faggioli.
In: Perspectives on Ocean Policy, p. 408-10, National Science Foundation 1975.

Descriptors: *Continental shelf, *Law of the sea, *International law, *Exploitation, *Navigation, Continental margin, Ships, Navigable waters, Monitoring, Economics, Jurisdiction, Beds under water, Income, Royalties, Payment, Coasts, Political aspects, Foreign countries.
Identifiers: Coastal states, Economic zones, Territorial sea, Revenue-sharing.

Extension of coastal state jurisdiction over the seabed and the right of transit for commercial vessels should be primary issues at the Law of the Sea Conference. As to coastal state jurisdiction, the position of most nations seems to favor jurisdiction to the seaward edge of the continental margin. Disagreement appears to be developing, however, as to what powers should be vested in the international authority which will be charged with overseeing exploitation of the ocean. In addition, there is uncertainty as to whether revenue-sharing by the international community in exploitation revenues derived from the continental margin will be mandatory or optional. If some type of revenue-sharing is required, royalty percentages will have to be determined. As to commercial transit, the primary question is whether vessels will be allowed unhampered transit through economic zone waters. It is suggested that any monitoring or interference rights granted to coastal states would seriously disrupt world economic trade and could provide a fertile source for international conflict. The answer to this issue will probably hinge on what enforcement rights are granted to coastal states over areas outside their territorial sea but within their economic zone. (See also W76-07330) (Hoffman-Florida)
W76-07349

COMMENTARY ON: FUTURE PROSPECTS FOR LAW OF THE SEA: COMMENTS ON CARACAS AND PREDICTION FOR THE FUTURE,
S. Levering.
In: Perspectives on Ocean Policy, p. 410-14, National Science Foundation 1975.

Descriptors: *International law, *Law of the Sea, *International waters, *Foreign countries, *Water resources, Environmental control, Commercial fishing, Fish management, Mining, Monitoring, Navigation, Exploitation, Negotiations, Decision making, Political aspects, Water resources development.

Although matters pertaining to economic zones and territorial seas have drawn considerable attention, the real importance of the Law of the Sea Conference will be how its decisions affect the future of mankind. Because of the abundance of living and non-living resources within the ocean, decisions relating to their exploitation will have long lasting effects. Unfortunately, the positions of most nations on law of the sea issues center around short sighted nationalism. Serious restrictions might, therefore, be placed on the free movement of commercial vessels and on scientific research. In addition, there will probably be little international monitoring concerning environmental protection and fish conservation. Nevertheless, there is a good chance of getting a treaty that will produce some beneficial results. There is hope, for example, of creating an international organization which will exercise environmental functions pertaining to deep seabed mining. The biggest stumbling block to the creation of such an organization will come in the delineation of the scope and nature of the duties to be given the organization. The hopes for an acceptable solution to this issue, as well as countless others, will depend on large part on the willingness of nations to be flexible in negotiating acceptable compromises. (See also W76-07330) (Hoffman-Florida)
W76-07350

FUTURE PROSPECTS FOR LAW OF THE SEA: THE FUNCTIONAL APPROACH AND THE LAW OF THE SEA,
J. N. Moore.
In: Perspectives on Ocean Policy, p. 421-28, National Science Foundation 1975.

Descriptors. *Water resources development, *Foreign countries, *Water policy, *Oceans, *Institutional constraints, Water resources, Management, Coordination, Law of the sea, Negotiations, International law, International waters, Political aspects, United States, Coasts, Continental shelf.
Identifiers: Ocean policy, Territorial sea, Unilateral action.

Two alternatives are available for the United States to achieve its ocean policy. The first choice involves working out an international agreement of numerous law of the sea issues at the upcoming Conference in Caracas. The second choice involves the passage of domestic legislation which will provide for unilateral action at home and abroad concerning ocean policies. It is suggested that the road to unilateralism will result in disastrous results. Because unilateral action is usually designed to protect national self-interest it will greatly increase the potential for international conflict in the world's oceans. In addition, it might result in worldwide fragmentation, thereby preventing the formulation of international treaties necessary to effectively coordinate and manage the vast resources of the ocean. International agreements, on the other hand, have already laid basic guidelines on several law of the sea issues, such as a 200 mile economic zone and a twelve mile territorial sea. While there are still complex issues to be worked out within these guidelines, their eventual solution will result in a uniform and international law. While such solutions will require flexibility in individual nation's bargaining positions, it is the only alternative compatible with the development of an international community common interest. (See also W76-07330) (Hoffman-Florida)
W76-07351

CURRENT DEVELOPMENTS IN DEEP SEABED MINING,
Hearings--Sub. Comm. on Minerals, Materials and Fuels Comm. on Interior and Insular Affairs, U.S. Senate, November 7, 1975, 1-249.

Descriptors: *Mining, *Financing, *International law, *Mining engineering, *Coasts, Oceans, Costs, Cost analysis, Federal Government, Beds, Construction costs, Economic feasibility, Foreign countries, Forecasting, International water, Metallurgy, Risks.
Identifiers: Federal Ocean Mining Administration, Domes Project.

Hearings were held before the Senate Subcommittee on Minerals, Materials and Fuels concerning current developments in the ocean mining industry, and the need for federal legislation to protect the industry's capital expeditures in case of international control and intervention. Subjects covered included nodule deposits providing for satisfactory mine sites, metallurgical problems of winning metals from nodules, and mining systems which have been developed to implement the project. Doubts as to economic feasibility and success no longer exist. The remaining problem is obtaining capital to finance each project, projected costs

of which range upwards of $300 million per project. Although present law permits uninhibited exploration and development the typical financing pledge extends at least 10 years. In view of the demonstrated desire of the international community to establish controls over such activity, the present absence of political sponsorship and security of tenure constitute an unacceptable business risk to financial institutions. Mining companies rely upon external debt financing. Representatives from financial institutions suggest that proposed bill S.713 if passed would provide the necessary inducements and assurances for security of tenure and freedom of operations even if the controversial licensing program is eliminated and only insurance and investment guarantees remain. (Hadoulias-Florida)
W76-07352

MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972.
Hearing--Subcomm on Oceans and Atmosphere, Comm on Commer, US Senate, 94th Cong, 1st Sess, May 20, 1975. 79 p.

Descriptors: *Oceans, *Water quality control, *Waste disposal, *Regulations, *Federal Government, Legislation, Legal aspects, Water law, Water pollution, Water pollution sources, Water pollution control, Water pollution abatement, Water quality, Environmental effects, Dredging, Sea water, Oceans, Permits, Economics, Economic impact, Organizations, Water pollution effects, Pollutants, Wastes.
Identifiers: Congressional hearings, Coastal water.

The Senate Subcommittee on Oceans and Atmosphere held a hearing to review and appraise the activities of Federal agencies responsible for carrying out the Marine Protection, Research, and Sanctuaries Act of 1972. The hearing concentrated on the regulation of dumping of all types of materials into ocean waters. Testimony was received from representatives of the Army Corps of Engineers, the Environmental Protection Agency (EPA), the U.S. Coast Guard and the Department of Commerce. This testimony primarily concerned E.P.A. dumping regulations and the functions of each of the represented organizations in administering and enforcing them. The representative of the Army Corps of Engineers stated that the dumping regulations have created economic hardship and suggested that disposed of dredged materials at ocean sites should not be substantially limited, especially since research showed such dumping to have minimal environmental impact. (Nursey-Florida)
W76-07353

OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS AND COASTAL ZONE MANAGEMENT ACT AMENDMENTS.
Joint Hearings----Comms. on Interior and Insular Affairs and Commerce, U.S. Senate, April 8, 9, 1975, p 697-1745.

Descriptors: *Oil fields, *Exploration, *Exploitation, *Leases, *Continental shelf, *Natural gas, Oil, Drilling, Geologic formations, Fossil fuels, Fuels, Oil wastes, Oil pollution, Locating, Offshore platforms, Surveys, Test wells, Oil spills, Engineering, Energy.
Identifiers: Congressional hearings, Coastal zone management.

These proposed amendments concern leasing policy changes for the outer continental shelf mineral deposits, principally oil and gas deposits. Principal bills discussed are S.130, S.426, S.521 and S.586. Major areas of concern include: (1) the advisability of exploration by the federal government as opposed to private industry; (2) possible competition promotion through lower initial cash bonuses and higher royalty payments; (3) possible delays in exploration and exploitation due to state opposition to offshore drilling; and (4) the advisability of adopting one or more of the proposed programs for economic assistance to affected states. An analysis and comparison of the bill provisions under discussion is included in the report. In addition the report presents two research studies, the American Petroleum Institute annual report on environmental research for 1975 and the National Advisory Committee on Oceans and Atmosphere report to the Secretary of Commerce regarding ocean engineering. (Comer-Florida)
W76-07354

LEGISLATION FOR OUTER CONTINENTAL SHELF R AND D.
Hearings--Sub Comm. on Energy Research, Development, and Demonstration--Comm. on Science and Technology, US H R, July 8, 9, 10, 11, 1975, p. 833-1721.

Descriptors: *Continental shelf, *Oil industry, *Leases, *Safety, *Pollution, Oil, Natural gas, Oceans, Marine geology, Oil wastes, Oil pollution, Natural resources, Oil fields, Exploitation, Exploration, Secondary recovery(Oil), Royalties, Drilling, Federal government, Planning legislation, Pipelines, Systems analysis, Resources, Water law, Administration.
Identifiers: Congressional hearings, Administrative regulations.

Five appendices have been submitted to the Subcommittee on Energy Research by various organizations. Appendix I contains information submitted by the Department of the Interior, including a list of secondary and tertiary recovery projects on federal lands, tables of royalty and production information, and regulations pertaining to mineral leasing, operations and pipelines on the Outer Continental Shelf (OCS). Appendix II consists of supplements to the Report of the Work Group on OCS Safety and Pollution Control. Appendix III is made up of reports to the United States Geological Survey on OCS petroleum operations. The reports focus on the following issues: (1) program planning to assure safety and pollution control; (2) application of systems analysis techniques to offshore oil and gas operations; (3) inspection strategies for use in the OCS; (4) standards development for OCS operations; and (5) methods for determining the condition of existing pipelines. Appendix IV presents proposed legislation relating explicitly to research and development of the OCS bills considered by the Subcommittee. The final appendix provides additional information on particular OCS research activities concerning resource assessment, leasing, and environmental programs, as well as diving safety and hydrocarbons in OCS waters. (Reinders-Florida)
W76-07355

OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS OF 1975 - PART I, PART II, PART III.
For primary bibliographic entry see Field 6G.
W76-07356

ENVIRONMENTAL LAW IN THE USA: II,
A. Wharam.
New Law Journal, Vol. 125, p. 547-48 (1975). 2 p.

Descriptors: *Legislation, *History, *Environmental control, *Federal Water Pollution Control Act, *Clean Air Act, Environmental engineering, Environment, Planning, Judicial decisions, Regulation, Administration, Governments, Legal aspects, Water resources development, Water law, Air pollution, Federal government, Federal jurisdiction, Navigable waters, State governments.

The current body of American environmental law was developed both through the United States' judicial system and through recent comprehensive legislation. The courts' early attempts to establish federal jurisdiction over navigable waters extended first to the issue of navigability and then on to issues of pollution and its control. By comparison, initial attempts to regulate pollution through federal legislation proved largely impractical, primarily because enforcement was left up to the states. Recently, however, more sweeping legislation has been passed to control both water and air pollution. The Federal Water Pollution Control Act and the Clean Air Act have given powers of enforcement to the Environmental Protection Agency to eliminate pollutant discharges into navigable waters along with powers to establish primary and secondary standards to protect the public from adverse effects of air pollution. States are required to implement plans in conformity with federal standards with allowance made for any state whose internal standards are more stringent than those required by federal regulations. (Welch-Florida)
W76-07358

ACHIEVING FEDERAL-STATE COORDINATION IN COASTAL RESOURCES MANAGEMENT,
Louisiana State Univ., Baton Rouge. Sea Grant Legal Program.
M. J. Hershman.
William and Mary Law Review, Vol. 16, No. 4, p. 747-72 (1975). 26 p.

Descriptors: *State governments, *Coasts, *Coastal engineering, *Planning, *Inter-agency cooperation, Federal-state water rights conflicts, Federal jurisdiction, Federal government, State jurisdiction, Decision making, Coordination, Interstate, Water policy, Political aspects, Organizations, Environmental control, Environment, Management, Water pollution control, Washington, California, Louisiana, Water law, Legislation.
Identifiers: *Coastal Zone Management Act.

Various levels of government become involved in determining resource issues under the Coastal Zone Management Act (CZMA). Problems arise between state and federal levels due to the various national and local resource allocation plans and differing ideas concerning national interest in resources. The article analyzes four major facility developments along with CZMA provisions concerning federal-state relations. The four facilities examined are: (1) Trident Submarine Base, Bangor, Washington; (2) Outer continental shelf (OCS) oil and gas leasing, California; (3) Deepwater Port, Louisiana; and (4) OCS oil and gas leasing, East Coast. Each state's coastal management program differs in its influence over major facility developments and in its decisionmaking competence, indicating the need for allocation of responsibilities. Recommendations include development of an ongoing coordination process subprogram housed outside the primary decision-making unit to consider national interest and federal consistency issues. In this manner federal dominance may be avoided by allowing state and local governments to apportion resource use and balance competing interests. (Welch-Florida)
W76-07359

THE CONCEPT OF STATE AND LOCAL RELATIONS UNDER THE CZMA,
National Oceanic and Atmospheric Administration, Washington, D.C.
W. C. Brewer, Jr.
William and Mary Law Review, Vol. 16, No. 4, p. 717-29 (1975). 13 p.

Descriptors: *State governments, *Water resources development, *Planning, *Inter-agency cooperation, *Coasts, Coastal plains, Coastal marshes, Governments, Management, Geographical regions, Beaches, Coastal engineering, Regions, Seashores, Shores, Coordination, Decision making, Land management, Power operation maintenance, Water management(Applied), Administration, Legislation, Social aspects, Political aspects, Federal government.
Identifiers: *Coastal Zone Management Act.

Effective operation of the Coastal Zone Management Act (CZMA), which prescribes minimum relationships for the state-locality relationship, depends upon a complex of rights and duties linking a state with its municipalities. Though united geographically, the CZMA is the first attempt to move from a specialized response to a general planning management for a large geographic area. Responsibility for making detailed land use decisions is placed at the state level rather than with the municipality, but program contributions are to be made by all levels of government. State control over actions of regional and statewide significance need only be modest to result in federal monetary support of state coastal zone programs. The state must select its methods, support them with specific and adequate legislative authority, and set forth the means for control and review in the coastal zone management program. The state thus can limit its participation in local affairs to a review function only while still insuring consistency with the program. (Welch-Florida)
W76-07360

PENNSYLVANIA PUBLIC TRUST DOCTRINE: ITS USE AS A RESTRAINT ON GOVERNMENT,
Duquesne Univ., Pittsburgh, Pa. School of Law.
R. C. Lane.
Duquesne Law Review, Vol. 13, p. 551-76 (1975). 25 p.

Descriptors: *Water policy, *Common law, *Pennsylvania, *Public lands, *Public rights, Public access, Public benefits, Legal aspects, Constitutional law, Permits, Water rights, Water control, Water law, Preferences(Water rights), Administrative decisions, Common law, Governments, Judicial decisions, Law of the sea, Legal review, History, Aesthetics.
Identifiers: *Public trust doctrine.

In 1971, by constitutional amendment, the Commonwealth of Pennsylvania adopted the public trust theory of natural resource management. While the public trust doctrine had previously been part of Pennsylvania's common law, it applied exclusively to waterways and the submerged land thereunder. The constitutional article imposes upon the state, as trustee, the duty to conserve and maintain all the public natural resources of the state. As a common law principle, the doctrine was struck down by the courts only when governmental action was violative of a specific public right, so that any change in the use of public lands or action which lessened the use of such lands was impermissible without a showing of legislative approval. The constitutional trust doctrine reaffirms the police power to regulate the use of land with aesthetic and historic consideration in mind; thus, both new powers and obligations are imposed upon the state. Whether the constitutional amendment standing alone is self-executing has yet to be definitively answered by the courts. Since the doctrine precludes the state from granting to others the right to use public lands in any way that would violate the equitable rights of the public, the limits placed upon the state's right to grant permits in this area is unclear. (Welch-Florida)
W76-07361

ENVIRONMENTAL LAW - STATUTORY INTERPRETATION - THE ENVIRONMENTAL PROTECTION AGENCY ENTERS THE NUCLEAR AGE -- COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. V. TRAIN 507 F2D 743 (10TH CIR. 1974),
Suffolk Univ., Boston, Mass. Law School.
J. A. Christopher.
Suffolk University Law Review, Vol 9, p. 1512-23 (1975). 12 p.

Descriptors: *Federal Water Pollution Control Act, *Radioactive waste disposal, *Water quality control, *Environmental effects, *Nuclear wastes, Nuclear powerplants, Powerplants, Nuclear energy, Thermal pollution, Water pollution sources, Disposal, Radioactive wastes, Waste treatment, Water pollution, Electric powerplants, Water quality control, Federal government, Judicial decisions.
Identifiers: *FWPCA Amendments of 1972.

A recent Tenth Circuit case, Colorado Public Interest Research Group, Inc. v. Train, resolved whether the Environmental Protection Agency (EPA) was responsible for the regulation of certain nuclear material discharged into navigable waters. Under the Federal Water Pollution Control Act Amendments of 1972 the EPA issued regulations specifically excluding regulatory responsiblity for nuclear material claiming that the Atomic Energy Act of 1954 placed responsibility for regulating the discharge of nuclear material in the Atomic Energy Commission (AEC). The court held the Amendments of 1972 to be inconsistent with the duties of the AEC and thus implicitly divested the AEC of such responsibility. The EPA radioactive material exclusions were so significant that the court found they would completely emasculate the statute's general policy. In holding the EPA responsible for the regulation of nuclear byproduct discharges, the court departed from the previously accepted atomic energy control methods and made an affirmative commitment toward pollution control in navigable waters. (Welch-Florida)
W76-07362

CANADIAN APPROACH TO THE THIRD LAW OF THE SEA CONFERENCE,
New Brunswick Univ., Fredericton. Law School.
C. C. Emanuelli.
University of New Brunswick Law Journal, Vol. 24, p. 3-28 (1975). 26 p.

Descriptors: *Continental shelf, *International waters, *Canada, *Law of the sea, *International law, Water law, Legal aspects, Navigation, Oceans, Coasts, Continental shelf, International commissions, Federal government, Foreign waters, Treaties, Water treatment, Pollution abatement, International bound and water commissions, Conferences, Water rights, Water quality, Fishing, Fish conservation, Fisheries.

The Canadian position with respect to the Third Law of the Sea Conference is typical of a coastal nation. Canada sees an urgent need for change in the principle of freedom of the high seas and in the principle of exclusive jurisdiction of the flag state. Canada has developed the concept of custodianship, that coastal states have a special interest and responsibility with regard to the protection of the marine environment and should act as custodians of that environment. An extreme application of this doctrine is embodied in Canada's proposal for the adoption of economic zones extending from coastal mainlands even farther than the custodianship zone. Canada also advanced specific proposals in these areas: (1) pollution; (2) fisheries management and exclusive fishing zones; (3) continental shelf definition and extent of rights therein; and (4) seabeds. The author sees the Canadian proposals, as granting coastal states new rights and powers rather than new responsibilities. (Welch-Florida)
W76-07364

THE RED SEA LIGHTS AGREEMENT: ANOTHER INSTANCE OF INTERNATIONAL COST-SHARING,
Bureau of Economic and Business Affairs, (State), Washington, D.C. Office of Maritime Affairs.
J. M. Garner.
American Journal of International Law, Vol. 69, No. 1, p 129-34 (1975). 7 p, 1 chart.

Descriptors: *Lighthouses, *International waters, *Cost allocation, *Navigation, *Ships, Economics, Operating costs, Oceans, Foreign countries, Canals, International law, Oil, Routing.
Identifiers: *Red Sea, *Suez Canal, *Tonnage, United Kingdom, Turkey.

When Turkey renounced its interest in two islands in the Red Sea, there was doubt as to who would obtain jurisdiction over the two navigational lights located on the islands. Because these lights provided an essential service to commercial vessels, twelve nations entered into an agreement whereby they would provide the funds necessary to maintain and operate the lights. Under this agreement, each participating nation's share of the cost is assessed in the proportion that the tonnage of its vessels using the lights bears to the total tonnage of all participating governments using the lights. This tonnage use will be based on transit statistics maintained by the Suez Canal. Although the agreement provides for no organizational structure, it does appoint the United Kingdom as the managing government in charge of collecting contributions and of preparing estimated annual expenses. Unfortunately, the closing of the Suez Canal drastically reduced the usefulness of the lights so that the tonnage figures for the first five months of 1967 had to be used for determining assessments. With the opening of the Canal in 1974, however, a new rate base is likely to be devised. The key question is whether the Red Sea waterway will reattract the petroleum cargoes it lost when the canal was closed. (Hoffman-Florida)
W76-07366

REPORT OF THE OCEAN POLICY RESEARCH WORKSHOP,
Rhode Island Univ., Kingston. Law of the Sea Inst.
R. L. Friedheim, and J. T. Kildow.
Law of the Sea Institute Occasional Paper Series, No. 26, July 1975. 47 p.

Descriptors: *Water resources development, *United States, *Water policy, *Non-structural alternatives, *Oceans, Project planning, Project purposes, Regulation, Water law, Surface waters, Navigation, Oceanography, Sea water, Information exchange, International waters, International commissions, Investigations, Data collections, Planning, Feasibility, Surveys.

In February 1975, a group of scholars, analysts and government officials interested in ocean policy attended the Research Applied to National Needs (RANN) Ocean Policy Research Workshop. The workshop's goals were to assess the art of research relating to ocean policy, determine the degree of consensus about the status of ocean policy, and propose a research agenda and methods to create a U. S. ocean policy. Workshop discussions ranged over broad areas of ocean policy but centered upon the ocean enclosure movement, policies flowing from this movement, the problems of doing ocean policy research within the context of the U. S. political system, and the need to improve policy research. The main marine policy research topics suggested by the workshop were: (1) National Ocean Institutions; (2) International and Transnational Ocean Institutions; (3) Ocean Transportation and Communication; (4) Exploitation and Management of Ocean Resources; (5) Ocean Environmental Protection; and (6) Ocean Scientific and Technological Information. The workshop emphasized the need to concentrate on the identification and analysis of emergent problems as well as opportunities for long-range policy guidance. (Welch-Florida)
W76-07367

CONTEMPORARY LAW OF THE SEA: TRANSPORTATION, COMMUNICATION AND FLIGHT,
Rhode Island Univ., Kingston. Law of the Sea Inst.
W. T. Burke.
Law of the Sea Institute Occasional Paper Series, No. 28, Nov. 1975. 38 p.

Descriptors: *Water resources development, *International waters, *Coasts, *Foreign countries, *Law of the sea, International law, Legal

aspects, Oceans, Water law, Navigation, Trespass, Regulation, Transportation, Boats, Ships, Canals, Communication water rights, Boundary disputes, Competing uses, Federal jurisdiction, Jurisdiction.

With increased ocean traffic, disputes arise over access to nearshore areas more and more distant from the coast and over the competence of coastal states to apply policy regulations in these areas. Areas of particular concern include internal waters, archipelagos, the territorial sea, ocean areas adjacent to the territorial sea, and use of the high seas for transportation and communication. Policy considerations include the desire to protect ocean resources but also to use the ocean as a resource for all, subject to necessary accommodations with adjacent coastal states. The author recommends a reformulation of the concept of innocent passage through the territorial sea, a formulation which include the interests of the coastal state while reducing the degree of discretion permitted by the present innocent passage concept. The author also examines the policies in each area of concern along with an appraisal of recent trends and recommendations for future planning and action. (Welch-Florida)
W76-07368

THE 1973 JAPANESE LAW FOR THE COMPENSATION OF POLLUTION RELATED HEALTH DAMAGE: AN INTRODUCTORY ASSESSMENT,
Hawaii Univ., Honolulu.
J. Gresser.
5 ELR 50229-51 (1975). 23 p.

Descriptors: *Foreign countries, *Compensation, *Air pollution effects, *Water pollution effects, *Pollution taxes(Charges), Legislation, Public health, Pollutant identification, Cost analysis, Economics, Legal aspects.
Identifiers: *Japan, *Tort liability.

Under recently enacted Japanese legislation, citizens may receive compensation payments for pollution-related illnesses upon certification by a special Health Damage Council. The burden of such payments is borne by the polluters who must contribute funds to a national pool based on a graduated emission charge and a tonnage tax on automobiles. An overview of the cultural-institutional setting, legal foundations, and basic mechanics of the Act is presented. Up until 1968, judicial interpretations of 'duty of care' and 'foreseeability' posed major obstacles to tort relief for Japanese plaintiffs. Then, however, the first of four major pollution trials took place affording a very broad reading to the various requirements for tort liability. These decisions were to give great impetus to compensatory legislation. The legislation itself has several major aspects, including: (1) designation of toxic substances; (2) designation of pollution zones; (3) designation of pollution victims; (4) assessment of victims costs and expenses; (5) determination of a budget; and (6) an allocation of cost. Although the actual effectiveness of this legislation will not be known for years, American pollution policy-makers should take careful note of the results. (Hoffman-Florida)
W76-07369

JUDICIALLY ENFORCEABLE RIGHTS UNDER NATIONAL ENVIRONMENTAL POLICY ACT,
California Univ., Livermore. Lawrence Livermore Lab.
J. C. Wharton.
Available from the National Technical Information Service, Springfield, Va 22161 as UCRL-51828. UCRL-51828 (May 1975). 41 p, 2 append.

Descriptors: *Legislation, *Environmental control, *Legal review, *Federal government, Judicial decisions, Adjudication procedure, Administrative agencies, Administrative decisions, Adoption of practices, Legal aspects, Legal review, Penalties(Legal), Water law, Decision making, Water rights, Administration, Institutions, Regulation, Environment, Law enforcement.
Identifiers: *National Environmental Policy Act.

This report evaluates judicially enforceable rights under the National Environmental Policy Act (NEPA). Early legal resistance to NEPA was based upon the idea that NEPA afforded no justi ciable rights. In Calvert Cliff's Coordinating Committee v. Atomic Energy Commission, however, the reviewability of federal administrative action was upheld absent a clear showing of contrary Congressional intent. The issue of substantive compliance with NEPA was the issue most frequently litigated. Other issues the courts have attempted to resolve include that of substantive review and the sufficiency or adequacy of the required impact statement. The standards of review used by the courts have been confusing and inconsistent. Even though court action has been unpredictable, the trend has been for the courts to act and even halt plans where there has been a fulfillment of an EIS with full disclosure but where environmental destruction has been threatened. Court decisions have thus accorded NEPA appropriate weight in the federal agency decision-making process. (Welch-Florida)
W76-07370

CRITERIA FOR THE IDENTIFICATION OF AREAS OF ENVIRONMENTAL CONCERN PREPARED FOR NORTH CAROLINA LAND POLICY COUNCIL.
North Carolina Land Policy Council, Raleigh.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 432, $5.75 in paper copy, $2.25 in microfiche. 1974. 129 p, 9 fig.

Descriptors: *North Carolina, *Forecasting, *Long-term planning, *Design criteria, *Comprehensive planning, *Decision making, Water resources development, Air pollution, Water pollution, Alternative planning, Recreation, Beaches, Wildlife habitats, Wetlands, Tidal marshes, Estuarine environment, Public access, Right-of-way, Resources, Beach erosion, Dunes, Floodways, Environmental control.
Identifiers: Coastal waters, Public trust doctrine, Resource limited areas, Flood hazard areas, Dynamic zones, Park zones.

This document recommends technical definitions for areas of 'Environmental Concern' under current or proposed State legislation. The introduction explains the concept and application of areas of environmental concern as one strategy in State land policy development. Subsequent sections provide technical criteria, explanation of significance, and current techniques for identifying 46 types of areas. Section B encompasses physiographic areas, including wetlands, flood hazard areas, areas of scenic quality, dynamic zones, recreational areas, earth resource limited areas, forest resource limited areas, water and air quality limited areas, and wildlife habitats. Section C covers sites of developmental concern, including key facilities, large scale developments and reservoirs. Section D applies to lands in public trust. Appendices suggest policy alternatives for various areas and discuss methods of aggregating data into an information system. (Reinders-Florida)
W76-07371

AMENDMENT TO SUBDIVISION CODE 62.
Hawaii County, Hawaii, Amending Subdivision Code 62, Rev. Ordinances (1967). 2 p.

Descriptors: *Building codes, *Flood control, *Construction, *Hawaii, *Flood plain zoning, Flood plains, Flood profiles, Regulation, Water zoning, Non-structural alternatives, Overflow, Floodways, Legislation, Decision making, Flood damage, Rain water, Rainfall-runoff relationships, Storm runoff, Storm water, Surface runoff, Legal aspects, Maps.

This amendment to the Hawaii County, Hawaii Subdivision Code No. 62 establishes further procedures to be followed in the design and approval of subdivisions located in 'F' Flood Hazard areas which are subject to inundation by rain or sea water. The submitted drainage map must include all waterways in the area plus the approximate location of areas subject to possible inundation or storm water overflow. No map approval will be granted if the area is found to be unsuitable for the proposed use by reason of its proneness to inundation until protective improvements have been taken by the subdivider and have been approved. Structures located in an 'F' District must be constructed to withstand flooding action, and new utilities must be constructed to minimize or eliminate flood damage. All water systems must be floodproofed and gate values must be installed in all water mains crossing into the 'F' District. Any sewage disposal facility proposed for such District shall not be approved if the system requires soil absorption and could not function due to high ground water or flood condition. (Welch-Florida)
W76-07372

AMENDMENT TO ZONING ORDINANCE 63.
Hawaii County, Hawaii, Amending Zoning Ordinance 63, Rev. Ordinances (1967). 2 p.

Descriptors: *Building codes, *Flood control, *Construction, *Hawaii, *Flood plain zoning, Flood plains, Floods, Regulation, Water zoning, Permits, Structures, Non-structural alternatives, Floodways, Flood damage, Legislation, Maps, Storm water, Storm runoff, Rain water overflow, Legal aspects, Structural design.

This amendment to the Hawaii County, Hawaii Zoning Ordinance No. 63 establishes further conditions for construction within an 'F' Flood Hazard District which is subject to inundation by rain or sea water. These regulations apply to areas designated by the Federal Insurance Administration as areas subject to special flood and tsunami hazards. Each zone map must specify the elevation of the flood level by a numerical suffix after the letter 'F'. Use permits for any structure in an 'F' District shall not be issued unless construction standards used in the structure eliminate or reduce the potential flood and tsunami danger. All new residential construction or substantial improvements shall have the lowest floor, including the basement, elevated to or above the level of the 100-year flood, or together with the attendant utility and sanitary facilities shall be waterproofed up to the level of the 100-year flood. (Welch-Florida)
W76-07373

ORDINANCE AMENDING BUILDING CODE ORDINANCE 501.
Hawaii County, Hawaii, amending Building Code Ordinance 501, Rev. Ordinances (1967). 1 p.

Descriptors: *Flood plain zoning, *Flood damage, *Hawaii, *Building codes, *Construction, Design criteria, Design standards, Flexible foundations, Legislation, Regulation, Standards, Safety factors, Flood plains, Water zoning, Storm water, Floods, Legal aspects, Structural design, Construction materials.

This amendment to the Hawaii County, Hawaii, Building Code Ordinance No. 501 establishes further procedures which must be followed in the design of all buildings or structures to be located within an area designated as an 'F' Flood Hazard District being subject to inundation by rain water or sea water. If a proposed building site is located within such an F District where it may be exposed to extreme water heights or possible wave forces, then appropriate construction designs must be adopted to prevent flotation, collapse or latteral movement of the structure. All materials and equipment used must also be resistant to any possible flood damage. (Welch-Florida)
W76-07374

AMENDMENT TO PLUMBING AND GAS CODE 502.
Hawaii County, Hawaii, amending Plumbing and Gas Code 502, Rev. Ordinances (1967). 3 p.

Descriptors: *Building codes, *Flood control, *Hawaii, *Plumbing, *Flood plain zoning, Pipes, Sewers, Sanitary engineering, Construction, Construction materials, Structural design, Design flood, Water zoning, Regulation, Design standards, Legislation, Drainage systems, Drainage districts, Drainage, Valves, Floods, Waste water disposal, Water districts.

This amendment to the Hawaii County, Hawaii, Plumbing and Gas Ordinance No. 502 specifies further construction regulations for buildings and structures which are located within an 'F' Flood Hazard District subject to inundation by rain water or sea water. All plumbing within such an F District must meet both the provisions of the plumbing code and those which have been added by this amendment. In the event the two provisions conflict then the amendment shall prevail. The new provisions require installation of an approved reduced pressure back flow prevention device at various locations in a water supply system within an F District. Regulations concerning drainage have also been amended and stringent requirements for sumps and receiving tanks have been imposed. They must be watertight and constructed of concrete, metal or an approved material and must be treated both internally and externally to resist corrosion. All drainage piping which serves fixtures below the second floor or the maximum expected flood level shall discharge only into an approved sump or receiving tank which itself must be so located as to receive the sewage or wastes by gravity. (Welch-Florida)
W76-07375

AMENDMENT TO ELECTRICAL CODE ORDINANCE 568.
Hawaii County, Hawaii, amending Electrical Code Ordinance 568, Rev. Ordinances (1967). 2 p.

Descriptors: *Building codes, *Flood control, *Hawaii, *Electric wires, Electrical engineering, Electrical equipment, Electrical wiring, Electric power failure, Flood plain zoning, Flood plains, Regulation, Construction, Design standards, Legislation, Structural design, Electric insulation, Electric terminals, Conductors, Switchgear, Watertight, Water proofing.

This amendment to the Hawaii County, Hawaii, Electrical Code Ordinance No. 568 specifies further provisions required in the construction of buildings in a designated 'F' Flood Hazard District identified as being subject to inundation by rain water or sea water. This amendment supplements the requirements of the National Electrical Code for all electrical work done in an area subject to inundation. All service equipment must be located above the estimated inundation level or must be installed in readily accessible water-tight enclosures; i.e., the water-tight construction must exclude moisture and be able to withstand the hydraulic pressure expected from the estimated depth of inundation. All feeder and branch circuits in such an 'F' District must also have approved ground fault circuit production. Any distribution equipment must likewise be located above the anticipated inundation level or be of water-tight construction. (Welch-Florida)
W76-07376

TANKER HYGRADE NO. 18 V. UNITED STATES (NO RECOVERY FOR CLEAN-UP COSTS RESULTING FROM OIL SPILL IN NAVIGABLE WATERWAYS).
526 F2d 805-12 (Ct. Cl. 1975). 8 p.

Descriptors: *Oil spills, *Navigable waters, *Compensation, *Negligence, *Third party effects, Oil pollution, Oil wastes, Boats, Legal aspects, Judicial decisions, Legislation, United States, Costs, Cleaning.
Identifiers: Clean-up costs, Corporations, Tort liability.

Plaintiff barge owner brought an action seeking to recover clean-up costs resulting from an oil spill in a navigable waterway. The plaintiff contended that the spill was caused by the negligent action of one of two accompanying tug boats. Since the spill was allegedly caused by a third party, the plaintiff was seeking reimbursement from defendant United States pursuant to a federal statute. The Court of Claims rejected the plaintiff's argument, however, finding that the discharge had not been caused solely by the acts of a third party. The court noted that one of the two tugboats charged with negligence was a wholly-owned subsidiary of the same parent company as the plaintiff. To prevent the avoidance of tort liability through the corporate shell, the court viewed the barge owner and the tug owner as one entity. For the plaintiff to recover, it was necessary to prove that the other tugboat was the sole cause of the accident. This issue, however, had already been decided in another court proceeding which had determined that the second tug was not the sole cause of the spill. Under the cumulative effect rule, the plaintiff was precluded from relitigating the causation issue and thus could not comply with the statutory requirement for recovery. (Hoffman-Florida)
W76-07377

IN THE MATTER OF FLOWERS (DUTY OF CARE OF BARGE OWNER AND DOCK OWNER DURING SEVERE FLOODING OF MISSISSIPPI).
526 F2d 242-45 (8th Cir. 1975). 4 p.

Descriptors: *Barges, *Docks, *Negligence, *Floods, *Mississippi River, Wharves, Legal aspects, Accidents, Judicial decisions, Ships, Missouri, Navigable waters, Rivers, Navigation.
Identifiers: Bailments, Reasonable care.

Plaintiff barge owner brought an action seeking damages allegedly caused by defendant quarry operator's failure to exercise reasonable care in assuring that the plaintiff's barge would not break away from its wharf during a severe flood. The trial court found that both the barge owner and the dock owner must exercise reasonable care when use of docking facility is for the mutual benefit of both parties. On appeal, the plaintiff contended that a bailment relationship existed and, therefore, the bailer-defendant should be presumed to be negligent unless it could show that the breakaway was not its fault. The Eighth Circuit expressed doubt as to whether a bailment relationship existed; furthermore, the court found the contention to be untenable in that sufficient proof had been introduced by the defendant to question the validity of the inference. Since the plaintiff had introduced no evidence of his own to prove negligence, the court held that the plaintiff had not met his burden of proof and affirmed the lower court's decision for the defendant. (Hoffman-Florida)
W76-07378

NIAGRA MOHAWK POWER CORP. V. UNITED STATES (POWER COMPANY'S RIGHT TO USE NAVIGABLE RIVER FOR POWER PURPOSES A PROPERTY RIGHT).
525 F2d 1380-91 (Ct. Cl. 1976). 10 p.

Descriptors: *Taxes, *Water rights, *Water contracts, *Power plants, Judicial decisions, Federal jurisdiction, Regulation, Property values, Navigable rivers, Legislation, Electric powerplants, State governments, New York.
Identifiers: *Property rights.

Plaintiff power company was seeking a federal income tax refund arising out of a disallowance of deductions for the obsolescence of water rights. Under the applicable state law prior to 1957 the power company's right to use the water was a recognized property right of indefinite duration. In 1957, however, legislation was enacted requiring a state power authority (PASNY) to undertake a redevelopment project. Under this legislation the plaintiff was to surrender its water use license in return for a contract that required PASNY to sell plaintiff the amount of power previously generated by the plaintiff. In 1961, this contract was accepted. Because it alleged that the water rights were made obsolete by the 1957 legislation, the plaintiff contended it should be allowed to deduct the value of those rights over the period 1957-1962. The court rejected this contention, finding that the rights were not made obsolete but were merely transferred to PASNY. Although the deduction was disallowed, the court found that the plaintiff was entitled to a loss on the exchange of the water rights for the contract rights. Thus, the case was remanded with instructions to allow a loss deduction if the basis of the water rights were found to have a value greater than the contract rights received in exchange. (Hoffman-Florida)
W76-07379

COASTAL PETROLEUM CO. V. UNITED STATES (NAVIGATION SERVITUDE INCLUSIVE OF LIMESTONE RIGHTS IN CENTER OF LAKE).
524 F2d 1206-12 (Ct. Cl. 1975). 7 p.

Descriptors: *Navigable waters, *Limestones, *Leases, *Dredging, *Water rights, Flood protection, Navigation, Mining, Exploitation, Legal aspects, Judicial decisions, Eminent domain, Compensation, Constitutional law, Levees, United States.
Identifiers: *Navigation servitude.

Plaintiff corporation was the lessee of a lease authorizing the mining of limestone from the bottom of a navigable lake. Subsequent to this lease, the defendant United States dredged limestone from an area encompassed by the lease to use in the construction of a levee on the lake. The plaintiff then brought this action seeking compensation for the limestone removed. The defendant sought a summary judgment, contending that any taking by the federal government was non-compensatory by reason of its navigation servitude. Although admitting the existence of such a servitude, the plaintiff contended that the taking right was limited to actions in aid of navigation and did not extend to actions aimed at achieving flood control. The Court of Claims, while accepting this general contention, found that the distinctions between flood control actions and navigational actions are not always clear. Here the project involving the dredging of the lake was to be considered 'authorized as a whole'. Consequently, since the levee project was governed by the navigation servitude, any limestone dredging incident to the main work was both authorized and non-compensatory. Summary judgment was then rendered for the United States. (Hoffman-Florida)
W76-07380

H. K. PORTER CO. V. BD. OF SUPERVISORS (ACCRETIONS NOT CONTIGUOUS TO PRIVATE PROPERTY BELONG TO STATE),
324 So2d 746-55 (Miss. 1975). 10 p.

Descriptors: *Accretion(Legal aspects), *Mississippi, *Land tenure, *Eminent domain, *Property rights, Leases, Compensation, Judicial decisions, Legislation, Legal aspects, Land use, Land classification, State jurisdiction, Rivers, Islands.
Identifiers: Property deeds.

Plaintiff landowner brought an action to confirm title to a tract of property it had acquired from defendant port authority and seeking title by accretion to an adjoining tract of land. After the trial court found the plaintiff to be the owner of the

original tract and the state to be the owner of land claimed by accretion, both sides appealed. Co-defendant state of Mississippi contended that the deed from the port authority contained a covenant that required the land to be used for industrial purposes. Since the land was no longer so used, the defendants argued that they should be able to reacquire the land for public purposes upon payment of reasonable compensation. They also alleged that the deed was void since statutory requirements pertaining to the transfer of state land had not been met. The Mississippi Supreme Court agreed with the defendants that the deed was void. Furthermore, under the defendants' power of eminent domain the land could be reacquired since the plaintiff no longer used the land for industrial purposes. The Supreme Court also went against the plaintiff as to the lands claimed by accretion, holding any accretion to a body of land arising from deposited spoils dredged from a bay and not contiguous to private property belongs to the state. (Hoffman-Florida)
W76-07381

AMERICAN IRON AND STEEL INSTITUTE V. EPA (EPA POER TO REGULATE EFFLUENT LIMITATIONS UNDER FEDERAL WATER POLLUTION CONTROL ACT),
526 F2d 1027-78 (3d Cir. 1975). 52 p.

Descriptors: *Cost analysis, *Industrial wastes, *Water quality control, *Effluent, *Federal Water Pollution Control Act, Discharge(Water), Water pollution sources, Regulation, Administration, Administrative agencies, Administrative decisions, Economics, Steel, Industrial water, Pollution abatement.
Identifiers: Administrative authority, Point source(Pollution), FWPCA Amendments of 1972.

Petitioner trade association and steel companies brought an action seeking a review of regulations promulgated by the Administrator of the Environmental Protection Agency pertaining to effluent limitations for point sources in the iron and steel manufacturing industry. The petitioner's basic challenge was that the Administrator was not authorized to promulgate such limitations under the Federal Water Pollution Control Act Amendments of 1972. Even if the Administrator does have such power, petitioners contended that the regulations failed to constitute valid guidelines in that they did not provide meaningful ranges in considering individual factors. In addressing petitioner's first contention, the court was concerned with the interrelationship of key sections of the Act. While acknowledging that the Act does not provide specific authorization to establish single number effluent limitations for existing point sources, the court held that the Administrator's authority to set such limitations can be inferred from section 301. The court went on to remand the case, however, finding that some of the regulations did not constitute valid guidelines. The court also found that the cost element involved in the guidelines had not received sufficient consideration effects the guidelines would have on investment decisions. (Hoffman-Florida)
W76-07382

PORT OF COOS BAY V. CITY OF COOS BAY (TERMINATION OF WATER SERVICE TO BAY WITHIN REASONABLE EXERCISE OF POLICE POWER WHEN BAY CONTAMINATED AND THERE IS A REFUSAL TO USE ANTI-BACKFLOW DEVICE).
541 P2d 156-60 (Ore. Ct App 1975).

Descriptors: *Oregon, *Judicial decisions, *Potable water, *Public health, *Regulation, Legal aspects, Water law, Local governments, State governments, Penalties(Legal), Water quality, Water quality control, Public utilities, Mechanical equipment, Freshwater.
Identifiers: Injunctive relief, Police power.

Plaintiff municipal corporation brought an action to enjoin defendant city and the municipal water board from terminating water service to the plaintiff. The defendants contended that the water service was terminated because the plaintiff had failed to comply with city regulations requiring the installation of reduced pressure anti-backflow devices in its main water connections. The plaintiff contended that this regulation was an unreasonable exercise of the police power. The Oregon Court of Appeals refused to grant the injunction, holding that the regulation requiring the installation of devices to protect the public health was a reasonable regulation within the scope of the police power. (Nursey-Florida)
W76-07383

WATKINS V COBB COUNTY COMMISSION (NO LIABILITY FOR PERFORMANCE OF GOVERNMENT FUNCTION SUCH AS CONSTRUCTION, INSTALLATION AND MAINTENANCE OF SEWER-DRAINAGE SYSTEM),
217 SE2d 298-304 (Ga. Ct. App. 1975).

Descriptors: *Georgia, *Judicial decisions, *Local governments, *Sewage disposal, *Overflows, Legal aspects, Water law, State governments, Adjacent land owners, Negligence, Penalties(Legal), Sewage effluents, Waste disposal, Drainage systems, Waste water.
Identifiers: Sovereign immunity, Nuisance(Legal aspects).

Plaintiff landowner brought an action against defendants county commission and developer for damages caused by sewage overflowing onto his land. The plaintiff contended that while the developer was making a tie-in from its condominiums to the county sewage system, some sealant got into the tie-in, blocking the sewer system which then overflowed onto the plaintiff's land. The Georgia Court of Appeals affirmed a summary judgement in favor of the county commission. The court held that the county could not be held liable for negligence because the maintenance of a sewer-drainage system is an immuse governmental function. The court further held that the county commission could not be held liable on a theory of nuisance because the condition was abated promptly by the county commission. (Nursey-Florida)
W76-07385

CITY OF PASCAGOULA V. RAYBURN (NO MUNICIPAL LIABILITY FOR DAMAGE BY UNPRECEDENTED RAINFALL CAUSING OVERFLOW OF DRAINAGE DITCH AND SUBSEQUENT DWELLING HOUSE DAMAGE),
320 So2d 378-82 (Miss. 1975). 5 p.

Descriptors: *Rainfall-runoff relationships, *Mississippi, *Ditches, *Overflow, *Drainage, Water conveyance, Judicial decisions, Legal aspects, Watercourses(Legal aspects), Damages, Accidents, Negligence, Hazards, Safety, Maintenance, Maintenance costs, Obstruction to flow, Barriers, Municipal water, Suburban areas, Rainfall, Rainfall intensity.

Plaintiff home owners brought this suit against defendant city to recover for damages to their home and furnishings due to the alleged negligence of the defendant in failing to maintain a drainage ditch near their home. The plaintiffs contended that the defendant allowed the ditch to become obstructed and to overflow even after the plaintiffs complained before the city council. The city argued it was not negligent since it maintained the ditch in the customary and accepted manner for that area, and that the overflow resulted from an unprecedented and unforeseeable rainfall. The Mississippi Supreme Court held that the defendant was not liable for damages which could not be guarded against by the exercise of reasonable care even though it was under a duty to properly maintain its drainage ditches and remove any obstructions within a reasonable time after obtaining actual or constructive knowledge. Here it was shown that the defendant took action after each complaint by the plaintiffs and thus was not liable for damages. (Welch-Florida)
W76-07386

GULF OIL CORP V. STATE MINERAL BOARD (NAVIGABLE WATER BOTTOMS HELD IN TRUST BY THE STATE FOR THE PUBLIC),
317 So2d 576-605 (La. 1975). 30 p p.

Descriptors: *Royalties, *Oil, *Louisiana, *Navigable waters, *Ownership of beds, Beds under water, Riparian rights, Streambeds, Legal aspects, Judicial decisions, State governments, Royalties, Costs, Income, Patents, Payment, Public lands, Public rights, Constitutional law, Oil industry, Administrative agencies, Beds.

Plaintiff corporation brought a concursus proceeding for determination of which adverse claimants were entitled to oil royalty payments derived from ownership rights in submerged land beneath navigable water. The private litigants in the proceeding claimed ownership of the land from a purchase made in 1910 and from a state patent issued in 1911. The state claimed beds of navigable water are owned by the state and cannot be alienated except by the authority of the public themselves. The Louisiana Supreme Court held that a statute providing that all suits to annul any patent must be brought within six years of issuance was intended only to cure formal defects in the patents and not to ratify absolutely null conveyences. The court found no original authority to transfer title to navigable water bottoms; thus there could be no ratification of any attempt to create title in another even where the patent was signedby the governor. The court further held that any grant of title to such water bottom made prior to a constitutional provision precluding such transfers must be made in express and specific language and will not be implied. In this case where the law relating to ownership was in a state of flux the royalties accumulated prior to the proceeding were ordered paid to the private parties with subsequent royalties to be paid to the state. (Welch-Florida)
W76-07387

WILLIAMS V. DUKE POWER CO. (NO LIABILITY FOR SILTING OF POND AND STREAM BY DESTRUCTION OF VEGETATION ON RIGHT OF WAY),
216 SE2d 482-87 (NC Ct. App. 1975). 6 p.

Descriptors: *Negligence, *North Carolina, *Streams, *Silting, *Deposition(Sediments), Right of way, Legal aspects, Powerline carriers, Electric power plants, Adjacent landowners, Silts, Water pollution control, Damages.

Plaintiff landowners brought action for damages against defendant power company, contending the company had negligently cut and cleared a right of way for a transmission line. The plaintiffs alleged that, as a result of this negligence, soil and debris entered and silted a stream on the plaintiffs' land. A jury verdict was rendered for defendant. On appeal, the plaintiffs put forth several assignmens of error, all of which involved the trial judge's rulings concerning there competency and admissibility of certain testimony. The appellate court rejected these contentions, however, and affirmed the trial court's decision. (Hoffman-Florida)
W76-07388

STATE V. GRIFFITH (REQUIREMENT TO HAVE TIDELAND TITLE: CONVEYANCE TO LOW WATER MARK),
216 SE2d 765-67 (SC 1975). 3 p.

Descriptors: *Ownership of beds, *South Carolina, *Wetlands, *Land tenure, *Boundaries(Property), High water mark, Water

rights, Water level fluctuations, Judicial decisions, Legal aspects, Boundary disputes, State governments, Real property, Streams, Tides.
Identifiers: *Tidelands.

Plaintiff State of South Carolina brought an action to settle a dispute with defendant landowner concerning title to certain tidelands. The State contended that it was the presumptive owner of the tidelands in question, and that no evidence had been introduced to negate that presumption. The defendant landowner contended that he had obtained title to the tidelands by virtue of a grant from the Lords Proprietors in 1717. The trial court entered a verdict for the defendant. The South Carolina Supreme Court reversed, holding that sufficient evidence had not been introduced to show that the grant had conveyed title to the tidelands since there was no language in the grant signifying an intent to convey title to any land below the usual high water mark. Consequently, it was necessary for the defendant to introduce additional evidence that would establish this intent. Since no such additional evidence was presented the court declared that title to the tidelands belonged to the State. (Hoffman-Floria)
W76-07389

STATE V YELSEN LAND COMPANY, INC. (REQUIREMENT OF CONVEYANCE OF TITLE TO LOW WATER MARK TO HAVE TIDELAND TITLE),
216 SE2d 876-79 (SC 1975). 4 p.

Descriptors: *South Carolina, *Wetlands, *Land tenure, *Real property, *High water mark, Water rights, Judicial decisions, Legal review, Legal aspects, State jurisdiction, Inlets(Waterways), Tidal waters, Water level fluctuations, Boundaries(Property), Boundary disputes, Low water mark.
Identifiers: *Tidelands.

Plaintiff State brought this action to settle a dispute with defendant claimants concerning title to certain tidelands. The State contended that it was the presumptive owner of the tidelands in dispute and that no evidence had been introduced to negate that presumption. The two defendant land companies, on the other hand, contended that they had obtained title to the tidelands by virtue of grants from the State. The trial court entered a verdict for the State. On appeal the South Carolina Supreme Court agreedwith the State that the burden of proof was on the defendants to affirmatively prove title to the tidelands. Since the claims of the two defendants were based upon seperate claims of title, the court considered each claim independently. The Court noted that one defendant's claim was based on a state grant conveying land bounded by an 'inlet' and 'sound or creek'. The court rejected this claim, however, holding that such descriptive language insufficent by itself to prove an intent to grant title beyond the high water mark. The Court also rejected the other defendant's similar claim, holding that the granting of land bounded by the 'Atlantic Ocean and the waters of Charleston Harbor' did not prove an intent to convey title to the low water mark. (Hoffman-Florida)
W76-07390

SCOTT V STATE HIGHWAY COMMISSION (SCENIC EASEMENT UNDER SCENIC WATERWAYS ACT),
541 P2d 516-22 (Ore. 1975). 7 p.

Descriptors: *River systems, *Oregon, *Scenic easements, *Condemnation, *Eminent domain, Scenery, Aesthetics, Regulation, Condemnation value, Judicial decisions, Rivers, Reasonable use, Non-structural alternatives, Water policy, Wild rivers, Constitutional law, Adjacent land owners.
Identifiers: State police power, *Scenic Waterways Act.

The Oregon Department of Transportation, pursuant to authority granted under the Scenic Waterways Act, denied plaintiff land owner permission to build two homes on land adjacent to a river. The plaintiff then brought a suit for damages alleging that the defendant State had taken her land without compensation. The trial court dismissed the complaint, on appeal, the plaintiff contended that the term 'scenic easement' in the Act described the right to regulate the use of adjacent land automatically acquired by the state. The plaintiff also contended that the provisions of the Act could only be exercised under the power of eminent domain, and not under the state police power. The Oregon Court of Appeals rejected both contentions, however, and affirmed the trial court decision. Although agreeing that the use of the term 'scenic easement' would support the plaintiff's contention, the court noted that if two statutory constructions are possible, the statute should be construed so as to uphold its constitutionality. Consequently, the court held that an easement was not involved in the state's right to regulate use of the adjacent land. As to the plaintiff's second contention, the court held that the state police power encompasses the right to regulate the use of private property if such regulation is needed to prevent harm to the public interest. (Hoffman-Florida)
W76-07391

NEAL V. HUNT (MINING OF WATER ALLOWED IN ABSENCE OF SHOWING OF DAMAGE TO WATER SUPPLY),
541 P2d 559-66 (Ariz. 1975). 8p.

Descriptors: *Arizona, *Percolating water, *Water transfer, *Water supply, Beneficial use, Ground water, Subsurface waters, Underground streams, Mining, Imported water, Appropriation, Judicial decisions, Legal aspects, Water table, Water levels, Water importing, Water rights.
Identifiers: *Water mining.

Defendant water suppliers wanted to mine water from beneath their land to transport to outside areas. Plaintiff landowners objected to this water mining, and brought an action to enjoin the suppliers' actions. The plaintiffs contended that the water pumping would lower the water level beneath their land, thus forcing them to dig deeper wells. After the trial court enjoined the defendants from removing percolating ground water in excess of a specified amount, both parties appealed. The defendants contended that the underground waters being mined were not percolating in nature, and thus were subject to appropriation. The plaintiffs, on the other hand, contended that the transportation of any water to outside areas should be enjoined since it adversely affected their rights. The Arizona Supreme Court rejected both contentions, however, holding that underground waters are presumed to be percolating in nature, and that the defendants had introduced no evidence negating that presumption. The Court also found, however, that the beneficial purpose of transporting water to arid lands should be encouraged when at all possible. Thus the defendants would be allowed to pump such amount of water as would do no damage to the plaintiffs' interest. (Hoffman-Florida)
W76-07392

HOLDEN V. LESUEUR COUNTY (REQUIREMENT OF PUBLIC WATER DETERMINATION BY DEPT. OF NAT. RESOURCES FOR ESTABLISHMENT OF DRAIN),
232 NW 2d 806-08 (Minn. 1975). 3 p.

Descriptors: *Drainage, *Marshes, *Minnesota, *Permits, *Ditches, Canals, Channels, Wildlife, Water conveyance, Legal aspects, Judicial decisions, Construction, Marsh management, Regulation, Legislation, Planning, Water permits, Administrative agencies, Control, State governments, Public rights.

Plaintiff landowners brought suit to prevent the establishment of a drainage ditch by defendant county. The proposed ditch was to be 5 miles long and would channelize a natural water course. The drainage would directly affect a 500 acre marshland along the main ditch channel. The plaintiffs contended that a decline in wildlife species in the area would result if the ditch were constructed. The plaintiffs also contended that the defendant had not received a permit from the Department of Natural Resources authorizing the establishment of such a drainage ditch and that the Department had not made a determination of whether public waters would be involved. The Minnesota Supreme Court held that statutory regulation allows construction of such a ditch only after a permit has been received and a determination has been made that no public waters are involved. Since neither requirements had been satisfied the court vacated the lower court's order establishing the ditch. (Welch-Florida)
W76-07393

6F. Nonstructural Alternatives

COMMUNITY RESPONSE TO THE FLOOD DISASTER PROTECTION ACT OF 1973,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Rural Sociology.
J. C. Preston, D. E. Moore, and T. Cornick.
Cornell Community and Resource Development Services Bulletin No. 10, Cornell University Water Resources and Marine Sciences Center, Ithaca, N.Y., 20 p, 1 fig, 3 ref. August 1975. OWRT A-058-NY (1) 14-31-0001-5032.

Descriptors: Insurance, *Flood Plain Insurance, Disasters, *Community development, *New York, Cities, Urbanization.
Identifiers: *Susquehanna River Basin(NY), *Flood Disaster Protection Act of 1973.

Community enrollment in the Federal Flood Insurance Program created by Congress in 1968 was on a voluntary basis. In 1973 Congress modified the program placing sanctions on identified municipalities which did not become eligible for the sale of flood insurance within a specified period of time. Despite these modifications, some communities have persisted in ignoring the federal program. The focus of this research was on why some communities have moved to enter the program while others have not. Ten identified flood-prone municipalities, towns, cities and villages, within the New York State portion of the Susquehanna River Basin were selected for the study. The study found that certain pre-existing aspects of local communities are associated with participation in the flood insurance program. The municipalities studied are likely to be in the program if they or their neighbors: had been flooded recently; had access to professional organizations or expertise for dealing with complex planning issues; and had previous experience with federal programs, land-use problems, and zoning.
W76-06810

NATIONAL ATTEMPTS TO REDUCE LOSSES FROM FLOODS BY PLANNING FOR AND CONTROLLING THE USES OF FLOOD-PRONE LANDS.
General Accounting Office, Washington, D.C.
GAO Report to Congress, Report RED-75-327, March 1975, 80 p, 1 tab.

Descriptors: *Administrative agencies, *Flood control, *Flood plain zoning, *Non-structural alternatives, *Federal government, Flood damage, Monitoring, Federal jurisdiction, Water law, Flood protection, Beneficial use, Multi-purpose projects, Administration, Comprehensive planning, Land use, Land classification, Classification.

Despite the adoption of a national flood control policy in 1936, flood losses increased steadily during the next thirty years. In 1966 a presidential task force developed a unified national program whereby federal agencies would provide leadership for state and local governments in developing comprehensive flood control programs. This report, prepared to inform Congress of the effectiveness of the national program, found that little progress had been made in curtailing flood losses. One of the major causes found for this lack of progress was that flood hazard areas were not being properly evaluated by the Federal agencies. As a result, the improper development of flood prone lands continued at an unabated pace. The federal agencies were also found to have been deficient in providing necessary monitoring of federal projects. Consequently, many flood control projects were not carried out under prescribed guidelines and procedures, with resulting disruption of the uniformity essential to the success of the overall national program. These weaknesses in the federal implementation of the program were found to be further aggravated by state and local governments which, for a variety of reasons, failed to seek or failed to enact federal assistance and recommendations. The report concludes with recommendations for solving these problems. (Hoffman-Florida)
W76-06822

STATE VIEWPOINT: (THE FEDERAL WATER POLLUTION CONTROL ACT AND THE STATES: LOVE IN BLOOM OR MARRIAGE ON THE ROCKS),
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5G.
W76-06824

SAMPLE FLOOD PLAIN ZONING ORDINANCE FOR LOCAL UNITS OF GOVERNMENT.
Minnesota Dept. of Natural Resources, St. Paul.
(Dec 1970). 62 p, 2 fig.

Descriptors: *Minnesota, *Flood plain zoning, *Land use, *Beneficial use, *Land classification, Permits, Reasonable use, Administration, Floodways, Flood protection, Non-structural alternatives, Flood plains, Flood protection, Penalties(Legal), Legal aspects, Legislation, Construction, Maps, Land management, Zoning, Adoption of practices.
Identifiers: *National Environmental Policy Act, *Flood fringe districts.

In order to promote the efficient management of flood prone lands, Minnesota has promulagated a sample ordinance to help implement the state's Flood Plain Management Act. The major purpose of the ordinance is to regulate land use development in flood plain areas. To accomplish this goal, the ordinance suggests that flood prone lands be zoned as either floodway districts, or flood fringe districts. While floodway districts will usually be limited to land uses with a low flood damage potential, flood fringe districts will generally not be so restricted, and may often contain numerous buildings and other structures. The sample ordinance contains several general provisions, including: establishment of the official zoning map; rules for the interpretation of district boundaries; and a warning and disclaimer of liability. The ordinance also presents a list of permitted and conditional uses suggested for the various districts. To insure compliance, all landowners must apply for a permit before making alterations or additions to their flood prone lands. The procedures to be followed in applying for the permit, and the criteria and procedures to be followed by the zoning agency in considering the permit application, are presented. Finally, the ordinance provides civil and criminal penalties for the violation of any of its provisions. (Hoffman-Florida)
W76-06828

SPECIAL FLOOD HAZARD INFORMATION REPORT ON SHINGLE CREEK, OSCEOLA AND ORANGE COUNTIES, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06914

FLOOD PLAIN INFORMATION: COASTAL AREAS, MARTIN COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06915

SPECIAL FLOOD HAZARD INFORMATION: VERNONBURG, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-06916

FLOOD PLAIN INFORMATION: HOCKANUM RIVER, VERNON, CONNECTICUT, TECHNICAL REPORT.
Buck and Buck, Hartford, Conn.
For primary bibliographic entry see Field 4A.
W76-06917

FLOOD PLAIN INFORMATION: CACHE LA POUDRE RIVER, COLORADO, VOLUME I, FORT COLLINS, LARIMER COUNTY.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-06918

FLOOD PLAIN INFORMATION: NAUGATUCK RIVER, ANSONIA, SEYMOUR, BEACON FALLS, NAUGATUCK, WATERBURY, WATERTOWN AND THOMASTON, CONNECTICUT.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-06919

SPECIAL FLOOD HAZARD INFORMATION: RAES CREEK, AUGUSTA AND RICHMOND COUNTY, GEORGIA,
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-06920

FLOOD PLAIN INFORMATION: KASKASKIA RIVER AND DRY FORK CREEK, DOUGLAS COUNTY, ILLINOIS, NO. 2.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-06921

FLOOD PLAINS OF THE SOUTH BRANCH SHIAWASSEE RIVER, LIVINGSTON COUNTY, MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 2E.
W76-07113

HYDROLOGIC AND ECONOMIC SIMULATION OF FLOOD CONTROL ASPECTS OF WATER RESOURCES SYSTEMS,
Hydrologic Engineering Center, Davis. Calif.
For primary bibliographic entry see Field 4A.
W76-07148

NEBRASKA FLOOD-PLAIN MANAGEMENT PROGRAM--PART I,
Nebraska Natural Resources Commission, Lincoln. Flood Plain Management Section.
A. E. Mathews.
Journal of the Hydraulics Division, Vol. 101, No. HY7, Proceedings paper No. 11437, Proceedings of the American Society of Civil Engineers, p 977-982, July 1975.

Descriptors: *Flood control, *Flood plains, Hydraulics, *Land use, State jurisdiction, Hydrology, Legislation, Regulation, Standards, Control, Governments, *Nebraska.
Identifiers: Water surface profile computation.

Preliminary work resulted in the special recommendation that legislative steps be taken to create a program of flood plain delineation and land use regulation in the State of Nebraska. Legislative Bill 893, the Nebraska Flood Plain Regulation Act enacted in 1967, provided the statutory authority. The Nebraska program utilizes the most recently developed techniques in the field of flood discharges and water surface profile computation. The statute provides for the legal establishment of floodway encroachment lines by order of the Nebraska Natural Resources Commission following a public hearing. It directs initial responsibility for the administration of regulation over the delineated and established floodways to the local governmental entity. Backup authority for regulatory control is vested in the state only on failure of the local government to adopt or enforce the necessary controls within 2 years of establishment. The regulatory program is compatible with both structural and nonstructural flood damages abatement programs. (See also W76-07216) (Bell-Cornell)
W76-07215

NEBRASKA FLOOD-PLAIN MANAGEMENT PROGRAM--PART II,
Nebraska Natural Resources Commission, Lincoln.
J. R. Cook.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. HY7, Proceedings paper No. 11438, p 983-987, July 1975. 3 ref.

Descriptors: *Flood control, *Channels, *Land use, *Nebraska, *Legislation, Hydrology, *Mapping, *Photogrammetry, *Regulation, Constitutional law, Rivers, Streams.
Identifiers: Urban planning, *Waterways(Watercourses), Public relations.

Administrators of Nebraska's Flood Plain Regulation Act have encountered many social, political, and legal problems in implementing floodplain regulation. As regulations become increasingly unpopular with increased implementation, legislative refinements in the act have been difficult to achieve. Appeasing those with serious objections is frequently impossible, even though such objection may be based upon misunderstanding or erroneous information. To be constitutional, floodplain regulations must not be arbitrary or capricious; they must bear a reasonable relationship to the objectives to be accomplished, and they must not result in a taking of property without just compensation. To assure compliance with these standards, property owners similarly situated must be treated alike and the techniques for computing flood discharges and for mapping those discharges must be carefully selected and accurately utilized. (See also W76-07215) (Bell-Cornell)
W76-07216

6G. Ecologic Impact Of Water Development

WILDLIFE, ECOLOGY AND PLANNING IN A PROPOSED IRRIGATION SYSTEM,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 4C.
W76-06804

NEPA AND THE CZMA: THE ENVIRONMENTAL IMPACT STATEMENT AND SECTION 306 GUIDELINES,
Rhode Island Univ., Kingston.
F. X. Cameron.

William and Mary Law Review, Vol. 16, No. 4, p. 773-92 (1975). 20 p.

Descriptors: *Environmental effects, *Legislation, *Coordination, *Environmental control, Coastal plains, Coasts, Water pollution, Water pollution control, Water policy, Water resources, Federal government, Federal jurisdiction, Political aspects, Administrative agencies, Governmental interrelations, Decision making, Comprehensive planning, Control, Project planning.
Identifiers: *Environmental impact statements, *Coastal Zone Management Act, *National Environmental Policy Act.

Both the National Environmental Policy Act of 1969 (NEPA) and the Coastal Zone Management Act of 1972 (CZMA) represent significant federal legislation in the area of environmental planning and management. NEPA focuses upon the federal agencies by requiring environmental impact statements on their proposed major actions, while CZMA focuses upon the state level, primarily promoting the development of a management process. The National Oceanic and Atmospheric Administration (NOAA) has decided in dealing with the interaction of requirements and procedures of these two Acts to require environmental impact statements when each state submits its coastal zone management plan for federal approval rather than during the development of its general guidelines as directed by NEPA under a strict statutory interpretation. All impact statements still must satisfy NFPA criteria, including identification of the environmental effects of all proposals and alternatives. All coastal zone resources should be considered for any possible environmental impacts of any proposed actions. (Welch-Florida)
W76-06817

SITING OF ENERGY FACILITIES IN THE COASTAL ZONE -- A CRITICAL REGULATORY HIATUS,
Marshall-Wythe School of Law, Williamsburg, Va.
S. C. Whitney.
William and Mary Law Review, Vol. 16, No. 4, p. 805-22 (1975). 18 p.

Descriptors: *Environmental effects, *Sites, *Nuclear energy, *Energy, Coasts, Oil industry, Data collections, Decision making, Administration, Grants, Government finance, Land use, Land management, Land development, Natural resources, Coordination.
Identifiers: *Coastal zone, *coastal Zone Mangement Act.

Because of numerous political and economic factors, it is critical that the United States take steps to provide the energy production necessary for national self-sufficiency. Several of America's most promising prospects, however, such as nuclear development and offshore oil and gas production, will be facing environmental opposition concerning the coastal zone siting of facilities necessary for their development. Because of Congressional inaction, the most effective solution to this siting problem would be in the state programs implemented under the Coastal Zone Management Act. To achieve local acceptance of facility siting, local decisionmakers must make available adequate information so that the public will be aware of all the effects, both good and bad, that will result from a particular facility siting. Once this information is available, forums for public participation are essential so that fears about the loss of local control on land use decisionmaking can be avoided. In addition, a grant program using offshore royalties should be developed to provide funds necessary for correcting or minimizing any adverse environmental effects that might result. Federal cooperation will be needed to assure localities that the federal government will not take dominant control of these programs once local authorization for facility siting has been given. (Hoffman-Florida)
W76-06819

CLASSICAL WRITERS OF INTERNATIONAL LAW AND THE ENVIRONMENT,
Montana Univ., Missoula. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W76-06825

THE ENVIRONMENT AND THE LAWYER,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-06826

CANADA AT THE THIRD LAW OF THE SEA CONFERENCE: POLICY, ROLE, AND PROSPECTS,
British Columbia Univ., Vancouver. Inst. of International Relations.
For primary bibliographic entry see Field 6E.
W76-06827

DESIGN APPROVAL AND ENVIRONMENTAL IMPACT.
Federal Highway Administration, Washington, D. C.
39 Fed. Reg. 41804-21 (1975). 18 p.

Descriptors: *Road construction, *Environmental effects, *Water quality, *Water conservation, *Highway effects, Highway beautification, Highways, Roads, Road design, Roadbanks, Civil engineering, Highway relocation, Administrative agencies, Environmental engineering, Coastal plains, Flood plains, Federal government, Wetlands, Transportation, Planning, Research priorities.
Identifiers: *Environmental impact statements, Administrative regulations.

The Federal Highway Administration (FHWA) of the Department of Transportation has set forth regulations and procedures for processing environmental impact and related statements, along with guidelines for public hearings concerning highway location and design, and procedural guidelines for the use of FHWA field officers in preparing action plans giving consideration to the best overall public interest. These regulations apply to all highway construction or reconstruction involving substantial planning and expenditures administered by FHWA. A final environmental impact statement must be prepared for all construction that after a required study is deemed significantly to affect the quality of the human environment. These regulations also enumerate the various internal requirements for environmental impact statements, including that of water quality impact. Possible water quality impacts include erosion and subsequent sedimentation problems, waste water disposal at roadside rest areas, and contamination of surface and ground water supplies by polluted fill material. Within the statement evaluations must also include coastal zone impacts, stream modification impacts, and flood hazards. (Welch-Florida)
W76-06834

RADIOECOLOGY OF WATER ORGANISMS, VOL. 2. DISTRIBUTION AND MIGRATION OF RADIONUCLIDES IN FRESHWATER AND SEA-WATER BIOCENOSES.
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5B.
W76-06861

WATER QUALITY IN VICINITY OF FENTON HILL SITE, 1974,
Los Alamos Scientific Lab., N.Mex.
For primary bibliographic entry see Field 5B.
W76-06909

A METHODOLOGY FOR IMPACT ASSESSMENT IN THE ESTUARINE/MARINE ENVIRONMENT,
California Univ., Livermore. Lawrence Livermore Lab.
K. F. Haven.
Available from the National Technical Information Service, Springfield, Va., 22161, as UCRL-51949, $4.00 in paper copy, $2.25 in microfiche.Report UCRL-51949, October, 1975. 43 p, 22 fig, 34 ref. W-7405-Eng-48

Descriptors: *Model studies, *Assessments, *Methodology, *Estuarine environment, Energy, *Environmental effects, Input-output analysis, Ecological distribution, Economic impact, Water pollution effects.
Identifiers: Marine environment, *Environmental impact.

The goal was to develop a model for assessing and evaluating the impact of present and future energy-related activities on the marine/estuarine environment. These impacts can be measured in economic terms by tracing the impact flow out of the economic sector through the marine environment and back into the economic sector in terms of changes in availability of natural resources. Two types of models are proposed; an ecological input/output model and a dynamic (difference equation) model. The ability to track lethal and sublethal, direct and indirect and short- and long-term effects of a variety of pollutants related to the production and use of energy resources is included in the acceptability criteria for the models. (Chilton-ORNL)
W76-06910

SURVEY OF CURRENT ENVIRONMENTAL RESEARCH ON SAN FRANCISCO BAY AND DELTA WATERS,
California Univ., Livermore. Lawrence Livermore Lab.
R. L. Ritschard.
Available from the National Technical Information Service, Springfield, Va. 22161 as UCRL-51950 $4.00 in paper copy, $2.25 in microfiche. UCRL 51950 October 175. 34 p, 4 tab, append. W-7405-Eng-48.

Descriptors: *Surveys, *Data collections, Projects, Deltas, Bays, *California, Computer programs, Water pollution control.
Identifiers: *San Francisco Bay and Delta(Calif).

This survey identifies the current research activities on the San Francisco Bay and Delta waters and describes the computer systems available to some of the government agencies and research institutions in the Bay-Delta region. Included in the report are the major federal and State agencies, academic institutons, consulting firms, and interested groups and have ongoing research programs. The survey of each agency or institution includes the specific projects, the goals of each project, the type of data collected, the years of study, and the funding agency. The method of data management and storage is described and information is available. (Chilton-ORNL)
W76-06911

SAN FRACISCO BAY AND DELTA SYSTEM: A SELECTED BIBLIOGRAPHY,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 2L.
W76-06912

SELECTED BIBLIOGRAPHY OF TERRESTRIAL, FRESHWATER, AND MARINE RADIATION ECOLOGY,
Washington State Univ., Pullman. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-06913

WATER RESOURCES PROBLEMS RELATED TO MINING.
American Water Resources, Association, Minneapolis, Minn.
For primary bibliographic entry see Field 5G.
W76-06938

THE ROLE OF TWO MANITOBA TRIBUNALS IN ENVIRONMENTAL DECISION MAKING,
Manitoba Univ., Dept. of Civil Engineering. Winnipeg.
C. Booy.
In: Ask the People, Proceedings of a Multi-Disciplinary Workshop on Public Participation in the Environmental Management Decision Making Process, C.G. Morely, ed. Agassiz Centre for Water Studies. University of British Columbia, Vancouver. p 67-84, 1973.

Descriptors: Administration, *Water rights, *Environmental effects, *Public rights, Competing uses, Water policy, Laws, Legal aspects, *Canada, Social participation.
Identifiers: *Public participation, *Manitoba, Environmental quality.

The Manitoba Clean Environment Commission (MCEC) and the Manitoba Water Commission (MWC) are examined to see how they managed to balance society's need for efficient governmental administration against the right of the public to be heard and to be informed in decisions affecting environmental quality. The MCEC in its first year (1968) issued only 50 of the hundreds of licenses required. Inadequate technical staff and lengthy hearing procedures caused serious delays, which have been partially alleviated by legislative amendments. The MWC was formed in 1967 to examine and make recommendations on the regulation of Lake Winnipeg, particularly in its use for power generation. Public involvement was sought in the formulation of the proposals, in submitting the proposals to the community's value judgements, and in hearing parties with a special interest in the regulation. Ideal conditions for an advisory commission are discussed, including political independece, public operation, and a role limited to supplying provisional advice. The MWC does have a significant role, which includes both informing the public in simple non-technical language of the possible impacts of different proposals, and listening to public opinion through open hearings. (Herr-North Carolina)
W76-07028

REPORT OF WORKING GROUP A: ENVIRONMENTAL DECISIONS ON MAJOR PROJECTS.
In: Ask the People, Proceedings of a Multi-Disciplinary Workshop on Public Participation in the Environmental Management Decision Making Process, C.G. Morely, ed. Agassiz Centre for Water Studies University of British Columbia, Vancouver Appendix A, 1973. 10 p, 2 fig.

Descriptors: *Project planning, *Legal aspects, *Decision making, *Environmental effects, *Evaluation, *Information exchange, Feasibility studies, Project purposes, Project feasibility, Public rights, Political aspects, Social aspects.
Identifiers: *Public participation, Public hearings, Environmental impact analysis.

The use of public input in making environmental decisions on major projects such as dams, highways, and pipelines, is examined in detail. Hearings at two distinct stages in the decision making process are suggested. Initial hearings at the thesis or conception stage would consider draft proposals. Two-way information flow between the public and the decision making agency would allow testing of proposed project guidelines. An independent hearing chairman or board would administer oaths and cross-examine parties, but generally hearings at this stage of the project should be as informal as possible. A second round of hearings should be held to examine specific project proposals after they have been developed. Applications should be tested against previously developed guidelines and criteria. Limited guideline revision should also be possible if deficiencies are obvious. Without applying strict legal rules of evidence, this hearing should be relatively formal, held before an independent tribunal which has the necessary technical expertise. Public assistance should be available to make certain that all interested parties can afford to participate effectively. There should be full disclosure of information to all parties. Final decisions, obviously of a political nature, should be made openly by politicians after ample public hearings and exposure of issues. (Herr-North Carolina)
W76-07029

REPORT OF WORKING GROUP B: PROMULGATION OF ENVIRONMENTAL QUALITY STANDARDS.
In: Ask the People, Proceedings of a Multi-Disciplinary Workshop on Public Participation in the Environmental Management Decision Making Process, C.G. Morely, ed. Agassiz Centre for Water Studies. University of British Columbia, Vancouver. Appendix B, 1973. 10 p, 1 fig.

Descriptors: *Standards, *Regulation, *Decision making, *Environmental effects, *Information exchange, Legal aspects, Design standards, *Water quality standards, Administrative decisions, Political aspects, Legislation, Planning, Adjudication procedure, Public rights.
Identifiers: Public hearings, Environmental quality standards, Public participation, Environmental impacts.

Problems in making environmental quality standards more responsive to the needs and preferences of the public are explored. Current practices which involve government setting standards after consulting with the affected industry are virtually beyond public input. Hearings should be held early in the process before specific value judgements become set in standards to which the decision maker becomes committed. A flow chart outlines the proposed process, including: problem identification with provision for hearings if that project is abandoned so that the public can be told why; strategy definition with public hearings; and promulgation of detailed technical standards, again with public hearings. Detailed information packages should be made available before all hearings to encourage well-informed public participation. Hearings should not be technical or legalistic although some form of 'cross-examination' should be included in the hearings on specific standards so that the public can question the government about the environmental impacts of the alternatives proposed. Notice should be published in the popular press and interested groups should be contacted. Review of the efforts of industry to comply with the standards should be guaranteed by a procedure, as should periodic public review of the standards. (Herr-North Carolina)
W76-07030

THE ENVIRONMENTAL IMPACT OF FERTILIZERS,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 5B.
W76-07100

ENVIRONMENTAL IMPLICATIONS OF RIVER BASIN DEVELOPMENT INCLUDING WATER QUALITY MANAGEMENT: GENERAL REPORT,
Fordham Univ. Bronx N. Y. School of Law.
For primary bibliographic entry see Field 5G.
W76-07134

LEGAL AND ADMINISTRATIVE CONTROL OF THE IMPACT OF RIVER BASIN DEVELOPMENT ON THE ENVIRONMENT,
Fordham Univ. N. Y. School of Law.
For primary bibliographic entry see Field 4A.
W76-07135

URBAN WATER MANAGEMENT AND COASTAL WETLAND PROTECTION IN COLLIER COUNTY, FLORIDA,
Black, Crow and Eidsness, Inc. Gainesville, Fla.
For primary bibliographic entry see Field 3D.
W76-07150

THE SOUTHEAST FLORIDA EXPERIENCE IN RESOLVING DEVELOPMENT AND ENVIRONMENT CONFLICTS,
Reynolds, Smith and Hills, Jacksonville, Fla.
H. G. Stangland, Jr., and R. T. Skrinde.
Water Resources Bulletin, Vol. 11, No. 4, p 783-795, August 1975. 5 fig, 2 tab, 12 ref.

Descriptors: *Water management(Applied), *Flood control, *Environmental control, Projects, Land development, Water supply, Water demand, Water resources, Rainfall, Canals, Drainage, *Florida.
Identifiers: *Environmental impact, *Water budget, Conflict, Review process.

Land development projects that are presumed to have regional impact according to the Florida Land and Water Management Act of 1972 are forced to minimize adverse environmental impact through a detailed procedure called Application for Development Approval (ADA). In Southeast Florida, as part of this review process, the water-supply and flooding conflicts must be resolved with the regional water management agency, the Central and South Florida Flood Control District (FCD). This paper discusses the efforts made to resolve these two conflicts for a large proposed residential development in Broward County, Florida. The project, as envisioned by Leadership Housing, Inc., places 25,000 dwelling units on the 3,960-acre site. The project is located in a flood prone area of the Hillsboro Canal Basin and is at the northwest edge of the Biscayne Aquifer. Significant land modification is required to flood-proof the project. The water-supply conflict was resolved only when the FCD was assured that the ultimate water demand for the project was balanced by the natural recharge to the site. Significant water-resources studies were required to produce these conflict resolutions. (Bell-Cornell)
W76-07153

STATISTICAL DESIGN BASIS FOR SUBMERGED DIFFUSER,
Quirk, Lawler and Matusky, New York.
For primary bibliographic entry see Field 5B.
W76-07214

PROBLEMS IN PERFORMING ENVIRONMENTAL ASSESSMENTS,
Virginia Polytechnic Inst., and State Univ., Blacksburg. Center for Environmental Studies.
K. L. Dickson, D. W. Kern, W. F. Ruska, Jr., and J. Cairns, Jr.
Journal of the Hydraulics Division, Vol. 101, No. HY7, Proceedings of the American Society of Civil Engineers, Proceedings paper No. 11463, p 965-976, July 1975. 10 ref.

Descriptors: Water resources, *Water management(Applied), *Environmental effects, *Methodology, *Assessment, Monitoring, Planning, Decision making, Computers, *Evaluation.
Identifiers: *Environmental impact statements, Federal laws.

Three general problems associated with the performance of environmental assessments are

identified. The first is the problem of defining the scope of study, including geographic boundaries, level of detail, and use of the assessment. The second category concerns problems involving interdisciplinary team organization and communication. The third problem relates to the selection of the appropriate methodology to use in performing the assessment. An analysis of these problems along with suggested approaches for their solution is presented. There are basically six types of methodologies which can be employed in an assessment effort: (1) descriptive; (2) checklist; (3) association Matrix; (4) network Analysis; (5) index Value; and (6) computer. Assessments should reflect the fact that their value ultimately is manifested by their utility to decision makers, the reviewing agencies, and the general public. (Bell-Cornell)
W76-07217

PERSPECTIVES ON OCEAN POLICY; CONFERENCE ON CONFLICT AND ORDER IN OCEAN RELATIONS, AIRLIE, VA., OCTOBER 21-24, 1974.
Johns Hopkins Univ., Washington, D. C. School of Advanced International Studies.
For primary bibliographic entry see Field 6E.
W76-07330

THE ROLE OF FORCE IN THE OCEAN,
Kings College, London (England).
For primary bibliographic entry see Field 6E.
W76-07332

REGIONAL APPROACHES TO LAW OF THE SEA: LATIN AMERICA,
University of Chile, Santiago.
For primary bibliographic entry see Field 6E.
W76-07335

REGIONAL APPROACHES TO LAW OF THE SEA: AFRICA,
For primary bibliographic entry see Field 6E.
W76-07336

ENVIRONMENTAL POLICY AND THE OCEAN,
Johns Hopkins Univ., Washington, D.C. School of Advanced International Studies.
For primary bibliographic entry see Field 6E.
W76-07339

ALTERNATIVE APPROACHES TO ORDER: TREATY AND NON-TREATY APPROACHES TO ORDER IN THE WORLD OCEAN,
Louisiana State Univ., Baton Rouge. Law School.
For primary bibliographic entry see Field 6E.
W76-07340

ALTERNATE APPROACHES TO ORDER: INTERNATIONAL OCEAN ORGANIZATION AND THEIR REGULATORY FUNCTIONS,
American Society of International Law, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-07341

COMMENTARY ON: ALTERNATE APPROACHES TO ORDER: INTERNATIONAL OCEAN ORGANIZATIONS AND THEIR REGULATORY FUNCTIONS,
American Society of International Law, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-07343

GEOGRAPHY AND THE LOS DEBATE: PROTECTION OF COASTAL STATE INTERESTS VERSUS THE PRESERVATION OF INTERNATIONAL INTERESTS,
Canadian Embassy, Vienna (Austria).
For primary bibliographic entry see Field 6E.
W76-07344

COMMENT ON: GEOGRAPHY AND THE LOS DEBATE: GEOGRAPHICAL FACTORS AND THE PATTERNS OF ALIGNMENT,
Columbia Univ., New York. School of Law.
For primary bibliographic entry see Field 6E.
W76-07345

CONGRESS AND A LAW OF THE SEA TREATY,
For primary bibliographic entry see Field 6E.
W76-07346

FUTURE PROSPECTS FOR LAW OF THE SEA: COMMENTS ON CARACAS AND PREDICTIONS FOR THE FUTURE,
Woodrow Wilson International Center for Scholars, Washington, D. C.
For primary bibliographic entry see Field 6E.
W76-07347

COMMENTARY ON: FUTURE PROSPECTS FOR LAW OF THE SEA: COMMENTS ON CARACAS AND PREDICTION FOR THE FUTURE,
For primary bibliographic entry see Field 6E.
W76-07349

COMMENTARY ON: FUTURE PROSPECTS FOR LAW OF THE SEA: COMMENTS ON CARACAS AND PREDICTION FOR THE FUTURE,
For primary bibliographic entry see Field 6E.
W76-07350

FUTURE PROSPECTS FOR LAW OF THE SEA: THE FUNCTIONAL APPROACH AND THE LAW OF THE SEA,
For primary bibliographic entry see Field 6E.
W76-07351

MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972.
For primary bibliographic entry see Field 6E.
W76-07353

OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS AND COASTAL ZONE MANAGEMENT ACT AMENDMENTS.
For primary bibliographic entry see Field 6E.
W76-07354

LEGISLATION FOR OUTER CONTINENTAL SHELF R AND D.
For primary bibliographic entry see Field 6E.
W76-07355

OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS OF 1975 - PART I, PART II, PART III.
Hearings -- Ad Hoc Select Common Outer Continental Shelf, USHR, June 7, 18, 19 and July 18, 19, 25, 1975. p. 1-915.

Descriptors: *Oil industry, *Continental shelf, *Oceans, *Federal jurisdiction, Water resources development, *Exploitation, Exploration, Environmental effects, Economics, Resource development, Geophysics, Geology, Oil fields, Oil spills, State jurisdiction, Federal Government, Marine geology, Federal project policy, Water pollution sources, Oil wells, Oil wastes, Governmental interrelations.
Identifiers: Congressional hearings, *Coastal zone management, *Territorial seas(Jurisdiction), Environmental Impact Statement, Administrative regulations.

The Committee on Outer Continental Shelf (OCS) held a series of hearings from June to November, 1975. The purpose of these hearings was to consider and report to the full House on legislation establishing a national policy for the management of oil and natural gas in the OCS, as well as to protect the marine and coastal environment, and to amend the Outer Continental Shelf Lands Act. The Committee considered proposed changes in the primary legislation structuring the management of federally owned lands beyond the territorial waters of the States. The mandate of the Committee was directed to House Bill 6218, a 38 page bill which addresses, among other things, the following points: (1) the need for a study to determine whether Federal or private exploration will be utilized to discover the resources of the OCS; (2) new and revised federal leasing procedures which take into consideration the social, economic and environmental impacts of drilling in the OCS; (3) inspection and enforcement of new safety standards for oil and gas operations; and (4) the provision of more participation by the States in OCS development. (Reinders-Florida)
W76-07356

LOS ANGELES DAM AND RESERVOIR PROJECT SAN FERNANDO VALLEY, LOS ANGELES COUNTY, CALIFORNIA, VOLS. I AND II.
Federal Disaster Assistance Administration.
For primary bibliographic entry see Field 8A.
W76-07357

ENVIRONMENTAL LAW IN THE USA: II,
For primary bibliographic entry see Field 6E.
W76-07358

ENVIRONMENTAL LAW - STATUTORY INTERPRETATION - THE ENVIRONMENTAL PROTECTION AGENCY ENTERS THE NUCLEAR AGE -- COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. V. TRAIN 507 F2D 743 (10TH CIR. 1974),
Suffolk Univ., Boston, Mass. Law School.
For primary bibliographic entry see Field 6E.
W76-07362

A CRITICAL EVALUATION OF THE NOVA SCOTIA ENVIRONMENTAL PROTECTION ACT,
Dalhousie Univ., Halifax (Nova Scotia). Law School.
For primary bibliographic entry see Field 5G.
W76-07365

JUDICIALLY ENFORCEABLE RIGHTS UNDER NATIONAL ENVIRONMENTAL POLICY ACT,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6E.
W76-07370

7. RESOURCES DATA

7A. Network Design

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1976.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-07128

7B. Data Acquisition

A METHOD FOR MONITORING EUTROPHICATION IN RIVERS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5A.
W76-06803

DETERMINING EMITTANCES FOR USE IN INFRARED THERMOMETRY: A SIMPLE TECHNIQUE FOR EXPANDING THE UTILITY OF EXISTING METHODS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W76-06923

POTENTIAL USE OF RADAR DIFFERENTIAL REFLECTIVITY MEASUREMENTS AT ORTHOGONAL POLARIZATIONS FOR MEASURING PRECIPITATION,
Ohio State Univ., Columbus. Atmospheric Sciences Program; and Ohio State Univ., Columbus. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 2B.
W76-06927

PRECIPITATION RATES FOR SOME TYPES OF SOLID HYDROMETEORS,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 2B.
W76-06934

SPECIFIC CONDUCTANCE IDENTIFIES PERCHED AND GROUND WATER LAKES,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2H.
W76-07023

METEOROLOGICAL INTERPRETATIONS OF THE IMAGES FROM THE NIMBUS 5 ELECTRICALLY SCANNED MICROWAVE RADIOMETER,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2B.
W76-07071

MEASUREMENT OF SEA SURFACE TEMPERATURE BY THE NOAA 2 SATELLITE,
Environmental Research and Technology, Inc., Concord, Mass.
For primary bibliographic entry see Field 2L.
W76-07072

LABORATORY INSTRUMENTS AND APPARATUS FOR INVESTIGATING THE THERMOPHYSICAL INTERACTION OF WATER WITH A FROZEN PEAT DEPOSIT,
For primary bibliographic entry see Field 2G.
W76-07080

CONTRIBUTION TO THE PROBLEM OF COMPUTING PRECIPITATION OVER MOUNTAIN DRAINAGE BASINS,
For primary bibliographic entry see Field 2B.
W76-07082

SOIL MOISTURE FLUX AND EVAPOTRANSPIRATION DETERMINED FROM SOIL HYDRAULIC PROPERTIES IN A CHAPARRAL STAND,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W76-07083

BULK DENSITY, SATURATION WATER CONTENT AND RATE OF WETTING OF SOIL AGGREGATES,
MacDonald Coll., Ste. Anne De Bellevue (Quebec). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-07084

A SEISMIC GROUND-WATER SURVEY IN NEW HAMPSHIRE,
New Hampshire Univ., Durham. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2F.
W76-07086

SUSPENDED-SEDIMENT SAMPLING TOWERS AS USED ON THE INTERTIDAL FLATS OF THE WASH, EASTERN ENGLAND,
Imperial Coll. of Science and Technology, London (England).
For primary bibliographic entry see Field 2L.
W76-07087

OPERATIONAL CHARACTERISTICS OF THE DECCA LAMBDA (6F) POSITIONING SYSTEM OVER FRESH WATER,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2H.
W76-07091

DEVELOPMENT OF AN OIL-WATER POLLUTION MONITORING SYSTEM,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5A.
W76-07092

APPLICATION OF GEOCHEMICAL PRINCIPLES, ISOTOPIC METHODOLOGY, AND ARTIFICIAL TRACERS TO KARST HYDROLOGY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-07112

GLACIOLOGY,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2C.
W76-07130

PREPARATION OF POLYESTER JACKETED SOIL COLUMNS AS PENETRATION, SUCTION PLATE AND GROUNDWATER LYSIMETERS, (IN GERMAN),
Goettingen Univ. (West Germany). Institut fuer Bodenkunde.
For primary bibliographic entry see Field 2G.
W76-07272

DESCRIPTION OF A NEW TYPE OF CORER FOR VERY FLUID SEDIMENTS, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Hydrobiology.
For primary bibliographic entry see Field 2J.
W76-07282

INSTRUMENTATION GUIDE FOR SEAWATER DISTILLATION PLANTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 3A.
W76-07320

FIELD INSTRUMENTATION IN GEOTECHNICAL ENGINEERING.
British Geotechnical Society, London (England).
For primary bibliographic entry see Field 8G.
W76-07328

METHOD FOR DETECTING AND LOCATING WATER-PRODUCING ZONES AND/OR WATER THIEF ZONES IN SUBTERRANEAN FORMATIONS,
Continental Oil Co., Ponca City, Okla. (Assignee).
For primary bibliographic entry see Field 4B.
W76-07448

7C. Evaluation, Processing and Publication

COMPARISON OF THE GEORGIA TECH, KANSAS, KENTUCKY, STANFORD AND TVA WATERSHED MODELS IN GEORGIA,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-06806

DATA MANAGEMENT IN COASTAL ZONE PLANNING,
Dames and Moore, Los Angeles, Calif. Planning Systems Group.
W. R. Miller, and S. C. Whitney.
William and Mary Law Review, Vol. 16, No. 4, p. 793-804 (1975). 12 p, 1 fig.

Descriptors: *Coasts, *Data collections, *Data transmission, *Monitoring, Management, Comprehensive planning, Decision making, Mapping, Maps, Topography, Measuring, Statistics, Measurement, Basic data collections, Charts.
Identifiers: *Coastal Zone Management Act.

In order to provide a framework for a successful coastal zone planning program, the Coastal Zone Management Act (CZMA) was enacted in 1972. An essential element to the ultimate success of this Act will be the compilation and availability of scientific and environmental data. Without this data, sound management decisions will be impossible. One of the ways to develop this data is through a data management program concerned with the planning and monitoring of the flow of information through a project. Because of the nature of coastal zone management this information will be of two types, mappable information, and decision information. This mappable information, which includes such aspects as the identification of the coastal zone boundaries, should be charted in detail first, so that a determination of what information is needed and how it will be used can be made before the actual data aquisition. In general, a data management program should involve seven basic tasks: identify issues of concern; identify data requirements; develop base map standards; develop data taxonomy; develop data structure diagrams; stimulate data evaluation procedures; and finalize data management standards. A brief description of the functions and goals of each of these tasks is presented. (Hoffman-Florida)
W76-06818

AN ANALYSIS OF FOUR SHOWERS WITH RAINFALL RATES > 250 MM/HR,
Hawaii Univ., Honolulu. Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W76-06907

SURVEY OF CURRENT ENVIRONMENTAL RESEARCH ON SAN FRANCISCO BAY AND DELTA WATERS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6G.
W76-06911

SPECIAL FLOOD HAZARD INFORMATION REPORT ON SHINGLE CREEK, OSCEOLA AND ORANGE COUNTIES, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06914

FLOOD PLAIN INFORMATION: COASTAL AREAS, MARTIN COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-06915

SPECIAL FLOOD HAZARD INFORMATION: VERNONBURG, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-06916

FLOOD PLAIN INFORMATION: HOCKANUM RIVER, VERNON, CONNECTICUT, TECHNICAL REPORT.
Buck and Buck, Hartford, Conn.
For primary bibliographic entry see Field 4A.
W76-06917

FLOOD PLAIN INFORMATION: CACHE LA POUDRE RIVER, COLORADO, VOLUME I, FORT COLLINS, LARIMER COUNTY.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-06918

FLOOD PLAIN INFORMATION: NAUGATUCK RIVER, ANSONIA, SEYMOUR, BEACON FALLS, NAUGATUCK, WATERBURY, WATERTOWN AND THOMASTON, CONNECTICUT.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-06919

SPECIAL FLOOD HAZARD INFORMATION: RAES CREEK, AUGUSTA AND RICHMOND COUNTY, GEORGIA,
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-06920

FLOOD PLAIN INFORMATION: KASKASKIA RIVER AND DRY FORK CREEK, DOUGLAS COUNTY, ILLINOIS, NO. 2.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-06921

LAKE MICHIGAN WATER QUALITY AND LAKE BED SURVEY, 1973,
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5B.
W76-06937

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME III, THE INTERIM PROGRAM,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W76-07016

HANDBOOK OF FORECASTING TECHNIQUES,
Stanford Research Inst., Menlo Park, Calif. Center for the Study of Social Policy.
For primary bibliographic entry see Field 6A.
W76-07062

GROUNDWATER YEAR BOOK 1968-70.
Department of the Environment, London (England). Water Data Unit.
For primary bibliographic entry see Field 2F.
W76-07063

AN OBJECTIVE RAINFALL INTERPOLATION AND MAPPING TECHNIQUE,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W76-07074

AVAILABILITY OF GROUND WATER IN THE UPPER CONNECTICUT RIVER BASIN, NORTHERN NEW HAMPSHIRE,
Geological Survey Concord, N. H.
J. E. Cotton.
Water-Resources Investigations 53-75 (open-file report), 1975. 1 sheet, 3 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Available water, *Water quality, *New Hampshire, Hydrologic data, Hydrogeology, Maps.
Identifiers: *Upper Connecticut River basin(NH).

This map provides assessment of the availability of the groundwater in the New Hampshire part of the upper Connecticut River basin. The report is a generalization of several hydrogeologic factors and provides a guideline for groundwater exploration which is useful in water- and land-use planning. The most productive aquifers in the basin are deposits of stratified sand or sand and gravel of Pleistocene age. Large aquifers of this type occur in the Connecticut River valley from North Stratford to West Stewartstown and in the valley of the Upper Ammonoosuc River (a tributary of the Connecticut River). The groundwater is generally of good chemical quality. However, iron and manganese in concentrations greater than the U.S. Public Health Service recommended limits for drinking water are not uncommon. (Woodard-USGS)
W76-07114

WATER RESOURCES OF THE LAKE OF THE WOODS WATERSHED, NORTH-CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
J. O. Helgesen, G. F. Lindholm, and D. W. Ericson.
For sale by U S Geological Survey, Reston, Va., 22092, $1.75 per set. Hydrologic Investigations Atlas HA-544, 1975. 2 sheets, 4 fig, 14 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Minnesota, Hydrologic data, Maps, Hydrographs, Streamflow, Flow rates, Aquifer characteristics, Water analysis, Chemical analysis.
Identifiers: *Lake of the Woods watershed(Minn).

Water resources in Lake of the Woods watershed, Minn., are only slightly developed. Much of the watershed consists of peat-covered wetlands. Essentially all water used is withdrawn from confined glacial drift aquifers characterized by high static head. Drift thickness ranges from zero to more than 200 ft. Underlying the drift is igneous or metamorphic bedrock of low water-yielding capability. Confined drift aquifers, a large surficial sand aquifer, Lake of the Woods, Rainy River, and Rapid River, all provide potential for future water-supply development. Groundwater is primarily of the calcium magnesium bicarbonate type, generally very hard and high in iron and manganese. Groundwater quality is related to position in the regional groundwater flow system. In the recharge area, groundwater is relatively low in dissolved solids and hardness. Downgradient in the flow system, water becomes more mineralized. Base flow to streams is low in winter and during prolonged dry spells. Most streams draining less than 100 sq mi have no flow at times. Stream water is commonly high in color, iron, and manganese. Biochemical quality of Rainy River water is poor to fair. (Woodard-USGS)
W76-07115

FLOODS IN PALATINE QUADRANGLE, ILLINOIS,
Geological Survey, Champaign, Ill.
H. E. Allen, D. W. Ellis, and D. E. Long.
Availability; For sale by USGS, Reston, Va. 22092, price $1.25. Hydrologic Investigations Atlas HA-87, 1964 (Reprinted 1975). 1 sheet, 8 fig, 3 ref.

Descriptors: *Floods, *Flood plains, *Flood frequency, *Flood profiles, *Illinois, Maps, Hydrographs, Streamflow, Hydrologic data.
Identifiers: Palatine quadrangle(Ill).

The approximate areas inundated by floods along streams in the Palatine 7 1/2-minute quadrangle, Illinois, are delineated on the map. Inundated areas are shown along Salt Creek and its unnamed tributaries, Arlington Heights Branch Salt Creek, and East Branch Poplar Creek for the floods of July 1957; along West Branch Salt Creek for the flood of October 1954; and along an unnamed tributary of West Branch Salt Creek for the flood of September 1961. Other figures show frequency of flood stages and flood profiles. (Woodard-USGS)
W76-07116

WATER RESOURCES OF THE CEDAR RIVER WATERSHED, SOUTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
D. F. Farrell, W. L. Broussard, H. W. Anderson, Jr., and M. F. Hult.
Availability: For sale by USGS, Reston, Va. 22092, price $1.75 per set. Hydrologic Investigations Atlas HA-552, 1975. 3 sheets, 10 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Minnesota, Hydrologic data, Maps, Water yield, Water utilization, Streamflow, Flow rates, Aquifer characteristics, Hydrogeology, Hydrographs, Dissolved solids, Nutrients.
Identifiers: *Cedar River watershed(Minn).

The Cedar River watershed includes 1,204 sq mi of mostly flat or gently undulating plain in parts of Freeborn, Mower, and surrounding counties in Minnesota. The average annual water budget for 30 years shows 30.3 in of precipitation, 5.9 in of surface runoff, and 24.4 in of evapotranspiration. Water use in millions of gallons for 1970 was 6,291 of groundwater and 791 of surface water. Domestic supplies accounted for about one-third and industrial use for about sixty percent of the total use. All 24 municipalities use water from bedrock aquifers, and 19 of those obtain at least part of their supply from the Cedar Valley-Maquoketa-Dubuque-Galena aquifer. The groundwater system is recharged primarily by infiltrating precipitation through glacial deposits. Groundwater movement is indicated by water-table and potentiometric maps and section diagrams. Water from bedrock and glacial aquifers is generally of acceptable quality for domestic use, dissolved solids generally less than 400 mg/l, very hard, and locally high iron and nitrate concentration. The Jordan aquifer locally contains high dissolved solids and sulfate concentration. Runoff is greatest during the spring snowmelt. High runoff may occur locally during summer after rainstorms. Runoff recedes during late summer to its lowest during late winter. (Woodard-USGS)
W76-07117

WATER RESOURCES OF THE RIVER RAISIN BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Lansing, Mich.
R. L. Knutilla, and W. B. Allen.
Availability: For sale by USGS, Reston, Va. 22092, price $1.75 per set. Hydrologic Investigations Atlas HA-520, 1975. 27 p, 2 sheets, 11 ref.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Water quality, *Michigan, River basins, Small watersheds, Hydrologic data, Maps, Streamflow, Aquifer characteristics, Physical properties, Topography, Hydrogeology.
Identifiers: *River Raisin basin(Mich).

This hydrologic atlas represents a part of a comprehensive study of the water resources of southeastern Michigan. Its purpose is to provide information on (1) the physical features of the River Raisin and its tributaries, (2) the characteristics of streamflow, (3) the quality of surface and groundwater, and (4) the availability of groundwater. The atlas is one in a series on the several river basins in southeastern Michigan. The River Raisin basin, an area of 1,072 sq mi is characterized by hilly to moderately undulating topography in the western and northwestern parts and by relatively flat terrain in the southeast. Tables summarize some physiographic data for selected subbasins in the River Raisin basin having about 2 or more sq mi of drainage area. Selected subbasins of the major streams include area above mouths of tributaries, and points of interest such as highways, towns, gaging stations, or dams, and below the confluence of the main stream and a tributary so as to include both drainage areas. Similar criteria were used for tributary streams, except where the tributary was too small to merit further dividing. Most subbasins are shown on the basin map. (Woodard-USGS)
W76-07118

GROUND-WATER LEVELS ON BOSTON PENINSULA, MASSACHUSETTS,
Geological Survey, Boston, Mass.
J. E. Cotton, and D. F. Delaney.
Availability: For sale by USGS, Reston, Va. 22092, $2.50 per set. Hydrologic Investigations Atlas HA-513, 1975. 4 sheets, 1 fig, 12 ref.

Descriptors: *Aquifer characteristics, *Groundwater, *Water level fluctuations, *Construction, *Foundations, *Massachusetts, Data collections, Hydrologic data, Maps, Water table, Dewatering, Excavation.
Identifiers: *Boston Peninsula(Mass).

Although groundwater is no longer a significant source of water supply on Boston peninsula, Mass., it continues to be important. In filled land areas the position of the water table is critical for the structural safety of buildings built on wooden pilings driven through fill into underlying deposits. Large-scale urban-renewal projects, with their multistoried buildings and block-sized excavations, require extensive dewatering. Such activity potentially threatens wooden foundation pilings of nearby buildings, because the wood may deteriorate if exposed to air by lowering the water table. This report gives the results of monitoring groundwater levels before, during, and after dewatering associated with the construction of the proposed Inner Belt expressway across the peninsula. In addition, data are provided on fluctuations of groundwater levels in the landfill areas where wooden pilings have been used. The water-table contour maps compare low water of September 1967 and high water of March 1968, respectively, with composite low and high water tables from 1936 to 1940. This report will aid roadway and foundation engineers in scheduling groundwater-recharge programs to protect wooden pilings during future construction projects and in assessing buoyancy factors in the design of substructures. (Woodard-USGS)
W76-07119

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 1. SURFACE WATER RECORDS--VOLUME 1.
Geological Survey, Menlo Park, Calif.
Geological Survey Data Report, 1974. 495 p, 4 fig, 1 tab, 3 ref.

Descriptors: *Basic data collections, *Surface waters, *California, *Water yield, *Streamflow, Gaging stations, Flow rates, Lakes, Reservoirs, Reservoir storage, Elevation, Crest-stage gages.

Surface-water records for the 1974 water year for California include data of streamflow or reservoir storage at gaging stations, partial-record stations, and miscellaneous sites. Records for a few pertinent gaging stations in bordering States also are included. The data generally comprise a description of the station and tabulations of basic data. For gaging stations on streams or canals a table showing the daily discharge and monthly and yearly discharge is given. For gaging stations on lakes and reservoirs a monthly summary table of stage and contents or a table showing the daily contents is given. Tables of daily mean gage heights are included for some streamflow stations and for some reservoir stations. Data collected at partial-record stations and miscellaneous sites are given in three tables. The first is a table of discharge measurements at low-flow; the second is a table of annual maximum stage and discharge; and the third is a table of discharge measurements at miscellaneous sites. (Woodard-USGS)
W76-07121

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 5. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--VOLUME 1. HUDSON BAY BASIN.
Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO, Wash., D.C. 20402, price $4.10. Water-Supply Paper 2113, 1976. 425 p, 1 fig.

Descriptors: *Basic data collections, *Surface waters, *Streamflow, *Lakes, *Mississippi River basin, Minnesota, North Dakota, Runoff, Flow rates, Gaging station, Reservoir storage, Water levels, Hydrologic data.
Identifiers: Mean streamflow, Minimum streamflow, Minimum streamflow, *Hudson Bay Basin.

This is one of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Hudson Bay and Upper Mississippi River Basin. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, mean, maximum, and minimum discharges. (Woodard-USGS)
W76-07122

A COMPARISON OF GLACIER MASS BALANCE BY GLACIOLOGICAL, HYDROLOGICAL AND MAPPING METHODS, SOUTH CASCADE GLACIER, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2C.
W76-07125

NUTRIENT CONCENTRATIONS OF SURFACE WATERS IN SOUTHERN FLORIDA, SEPTEMBER 1970 TO APRIL 1975,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5A.
W76-07126

INDEX OF SURFACE WATER STATIONS IN TEXAS, JANUARY 1976.
Geological Survey, Austin, Tex.
Geological Survey Texas District report, 1976. 21 p, 1 plate, 2 tab.

Descriptors: *Indexing, *Data collection, *Sites, *Surface waters, *Texas, Gaging stations, Water measurement, Tides, Water quality, Streamflow, Sediments, Flood data, Reservoirs, Organic compounds, Pesticides.

This index of surface-water data-collection sites in Texas shows the station number and name, type of data collected, and the office principally responsible for the data collection. A permanent numerical designation for gaging stations has been adopted on a nationwide basis; stations are numbered and listed in downstream order. As of October 1, 1975, 476 stream-gaging, 80 reservoir-content, 12 stage, 60 flood-hydrograph partial-record, 12 flood-profile partial-record, 155 low-flow partial-record, 4 crest-stage partial-record, 56 tide-level, 118 daily chemical-quality, 30 continuous-recording water-quality, 109 periodic chemical-quality, 172 periodic organic-quality, 118 pesticides, 5 sediment, 32 periodic sediment, 79 periodic biological, and 68 reservoir-inventory stations were in operation. (Woodard-USGS)
W76-07127

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1976.
Geological Survey, Austin, Tex.
Geological Survey Texas District Report, January 1976. 29 p, 1 map.

Descriptors: *Water resources, *Projects, *Texas, *Networks, Surface waters, Groundwater, Water quality, Gaging stations, Streamflow, Bibliographies, Publications, Data collections, Hydrologic data, Reviews.

Water-resources investigations by the U.S. Geological Survey in Texas consist of the collection of basic records through the hydrologic-data network, interpretive studies, and research projects. The basic-data records and the results of investigations are published by the Geological Survey or by cooperating agencies. This report describes the water-resources projects and activities of the Geological Survey in Texas for the 1976 fiscal year (July 1, 1975 to September 30, 1976). (Woodard-USGS)
W76-07128

WATER-LEVEL RECORDS FOR THE SAN LUIS VALLEY OF COLORADO, 1972-76,
Geological Survey, Denver, Colo.
R. E. Fidler, and R. D. Penley.
Open-file report, February 1976. 2 fig, 1 tab.

Descriptors: *Groundwater resources, *Water levels, *Basic data collections, *Water wells, *Colorado, Well data, Aquifers, Water level fluctuations, Measurement, Planning, Irrigation.
Identifiers: *San Luis Valley(Colo).

Water-level measurements were made in more than 140 wells in the San Luis Valley of Colorado during January 1976. Changes in water levels from January 1975 to January 1976 ranged from a rise of 13.2 feet (4.0 metres) to a decline of 8.4 feet (2.6 metres) in Costilla County. Measurements for the four preceding winters are also included to serve as references illustrating declining or rising water levels. These data can be used by well owners for planning their irrigation schedules for the next irrigation season and can be used by water managers for developing plans to manage the groundwater resources. (Woodard-USGS)
W76-07129

REVISED ESTIMATES OF MEAN-ANNUAL RUNOFF AND SUMMARY OF PRECIPITATION AND DISCHARGE DATA FOR POST HEADQUARTERS AREA, WHITE SANDS MISSILE RANGE, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
A. G. Scott.
Open-file report 76-86, February 1976. 30 p, 5 fig, 4 tab, 10 ref.

Descriptors: *Average runoff, *Forecasting, *Rainfall-runoff relationships, *Military reservations, *New Mexico, Data collections, Hydrologic data, Climatic data, Deserts, Stream gages, Rain gages, Hydrographs.

Identifiers: *White Sands Missile Range(N Mex).

Presented are revised estimates of runoff based on all available pertinent data and all precipitation and runoff data collected by the U.S. Geological Survey at White Sands Missile Range, N. Mex. Estimates are made of long-term mean-annual runoff from the east slopes of the Organ Mountains at seven sites where the stream channels cross the north-south access road in the Post Headquarters area. The data may be used to determine whether runoff that now passes through the area and onto the barren desert could be used to augment the water supply of the Post area. (Woodard-USGS)
W76-07131

RIVER BASIN PLANNING - BASIC CONCEPTS FOR DECISION ANALYSIS AND PLANNING FOR GRADUAL EXPANSION OF THE INFORMATION BASE,
Economic Commission for Asia and the Pacific, Bangkok (Thailand).
For primary bibliographic entry see Field 4A.
W76-07133

HYDROLOGIC AND ECONOMIC SIMULATION OF FLOOD CONTROL ASPECTS OF WATER RESOURCES SYSTEMS,
Hydrologic Engineering Center, Davis. Calif.
For primary bibliographic entry see Field 4A.
W76-07148

HEC-5C, A SIMULATION MODEL FOR SYSTEM FORMULATION AND EVALUATION,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 6A.
W76-07149

8. ENGINEERING WORKS

8A. Structures

CONSTRUCTION AND PERFORMANCE OF THE HESS CREEK EARTH FILL DAM, LIVENGOOD, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 8D.
W76-07085

SPILLWAY FOR LITTLE GOOSE DAM, SNAKE RIVER, WASHINGTON, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-07094

LITTLE GOOSE DAM, SNAKE RIVER, WASHINGTON, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
R. L. Johnson, and L. Z. Perkins.
Available from the National Technical Information Service, Springfield, Va., 22161 as AD/A-010 346 $7.50 in paper copy, $2.25 in microfiche copy. Technical Report No. 110-1, April 1975. 179 p, 90 fig, 10 tab.

Descriptors: *Model studies, *Hydraulic models, *Dams, *Spillways, *Washington, Fish ladders, Cofferdams, Energy dissipation, Locks, Structures, Dam design, Hydraulics.
Identifiers: *Little Goose Dam(Wash), *Snake River(Wash).

A 1:100-scale hydraulic model was used to study the alignment of structures, excavation requirements, and flow conditions at Little Goose Dam. Tests of first-step construction led to relocation of the temporary fishway, use of rockfill groins along the north shore, selection of limits for disposal fills, and reductions of excavation, number of cofferdam cells, and height of embankments. The tests indicated that flow conditions during the first phase of second-step construction would be acceptable and that excavation planned for the second phase could be reduced. Approach flow into the completed spillway and powerhouse was satisfactory. The excavated tailrace could be raised 20 ft without decreasing head on the powerhouse. Poor entrance conditions into the lower lock approach were eliminated by shortening and reshaping a protective fill along the river side of the approach. Performance of the fish collection system improved when the north fishway entrance was moved upstream and a 90-ft-long rock dike was placed adjacent to the right wall of the spillway roller bucket. Differences between final design (model) and contract (prototype) structures and excavation plans had no significant effect on flow conditions in the tailrace. Should the dentates in the spillway bucket erode, the hydraulic jump will move downstream, desired head between the fishway entrances will be eliminated, and erosion of the riverbed will be increased. (Sims - ISWS)
W76-07095

EARTHQUAKE: CORRELATION BETWEEN PIPELINE DAMAGE AND GEOLOGIC ENVIRONMENT,
Geological Survey, Menlo Park, Calif.
R. Kachadoorian.
American Water Works Association Journal, Vol 68, No 3, p 165-167, March 1976. 2 tab.

Descriptors: *Design criteria, *Pipelines, *Earthquakes, *Engineering geology, *Earthquake engineering, Seismic design, Geologic formations, Bedrock, Reviews, Evaluation.

Engineers working in the earthquake-prone circum-Pacific belt must consider seismic effects as well as normal problems in the design, construction, and maintenance of pipelines. As cities grow, the engineer is called upon to design increasingly more complex pipeline systems to provide the user with the necessary water, gas, oil, and other products. As the pipeline systems become more complex and widespread, they become more susceptible to damage by an earthquake. Damage to pipelines from both the direct and indirect effects of earthquakes are shown to be least in bedrock, intermediate in coarse-grained sediments, and maximum in fine-grained sediments. If maintenance and repair costs after an earthquake are considered in a route selection for a pipeline, a more expensive route may be more desirable from the long-term standpoint. (Woodard-USGS)
W76-07124

DYNAMIC BEHAVIOR OF BOX-GIRDER JETTIES,
Queen Mary Coll., London (England). Dept. of Civil Engineering.
T. J. Poskitt.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. WW2, Proceedings paper No. 11310, p 181-22, May 1975. 7 fig, 1 tab, 13 ref.

Descriptors: *Jetties, *Coastal engineering, Design, Dynamic, Testing, Mathematical models, Systems analysis, Steel.
Identifiers: *Box girders, *Force, *Steel beams.

Economy in the design of maritime jetties has led to the investigation of structural form using frames of steel box girders. However, due to their greater flexibility, lower structural damping capacity, they are prone to vibration hazards. A general analytical procedure for studying this phenomenon is given and has been checked by a series of experiments on a model. The sources of disturbance that a jetty will be subjected to are either transient or steady. The first covers cases of impact due to cargo handling or suddenly applied bollard forces, while the second category is concerned with periodic forces, e.g., rotating machinery, vortex shedding, or wave forces. For the first category, methods of determining peak stresses and displacements are given while for the second category it is shown that under certain conditions resonant states can occur that could render the jetty unserviceable. (Bell-Cornell)
W76-07208

PROPERTIES OF SOIL IN THE SAN FERNANDO HYDRAULIC FILL DAMS,
California Univ., Berkeley.
For primary bibliographic entry see Field 8D.
W76-07219

THE SLIDES IN THE SAN FERNANDO DAMS DURING THE EARTHQUAKE OF FEBRUARY 9, 1971,
California Univ., Berkeley.
For primary bibliographic entry see Field 8B.
W76-07220

A HISTORY OF BUREAU OF RECLAMATION CONSTRUCTION- PART I,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
H. G. Arthur.
Journal of the Construction Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. CO1, Proceedings paper No. 11189, p 51-68, March 1975. 4 fig, 6 tab.

Descriptors: *Canals, *Construction, *Dams, *History, *Penstocks, *Spillways, Outlet works, Control structures.
Identifiers: *Bureau of Reclamation.

The Bureau of Reclamation and the construction industry have worked in partnership to develop water resources in the 17 western states before and during the years 1925 to 1975, which mark the first half century of the Journal of the Construction Division of ASCE. The construction accomplishments on Reclamation projects built prior to 1925 are summarized. Selected dams, spillways, outlet works, penstocks, canal and canal structures built on Reclamation projects are described in this part as are the methods of constructing them. The designs of the structures and the methods and equipment used to build them have changed gradually. However, landmark structures and construction methods can be cited and are described. (See also W76-07223) (Bell-Cornell)
W76-07222

A HISTORY OF BUREAU OF RECLAMATION CONSTRUCTION- PART II,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
H. G. Arthur.
Journal of the Construction Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. CO1, Proceedings paper No. 11190, p 69-84, March 1975. 4 fig, 23 ref.

Descriptors: *Water resources, *Bridge construction, *Pipelines, *Powerplants, *History, *Construction, *Transmission towers, *Safety, Tunnels, Pumping plants.
Identifiers: *Bureau of Reclamation.

The Bureau of Reclamation and the construction industry worked in partnership to develop water resources in the 17 western states before and during the years 1925 to 1975, which mark the first half century of the Journal of the Construction Division of ASCE. Reclamation project features include pipelines, tunnels. pumping plants, power plants, power system structures, and bridges. Significant examples of these project features and of

construction methods used in the 50 years of Reclamation history since 1925 are described. (See also W76-07222) (Bell-Cornell)
W76-07223

SIMULATION OF PIERS IN HYDRAULIC MODELS,
Manchester Univ. (England). Department of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-07231

MARINE SOIL MECHANICS,
Norwegian Geotechnical Inst., Oslo.
For primary bibliographic entry see Field 8D.
W76-07321

PAPERS OF INTERNATIONAL CONFERENCES 1972-1974.
Public Works Research Institute, Ministry of Construction, Tokyo, Japan.
For primary bibliographic entry see Field 8D.
W76-07324

PAPERS OF INTERNATIONAL CONGRESSES 1972-1974.
Public Works Research Institute, Ministry of Construction, Tokyo, Japan.
For primary bibliographic entry see Field 8D.
W76-07325

LOS ANGELES DAM AND RESERVOIR PROJECT SAN FERNANDO VALLEY, LOS ANGELES COUNTY, CALIFORNIA, VOLS. I AND II.
Federal Disaster Assistance Administration.
December, 1975. 848 p, 14 fig, 35 tab, 1 ref, 8 append. Final HUD-R09-EIS-75-2F.

Descriptors: *Dam construction, *Reservoir construction, *Project planning, *Environmental effects, Water resources development, Design criteria, Water policy, Topography, Flood control, Soil erosion, Recreation, Project feasibility, Federal project policy, Economics, Project benefits, Area redevelopment, Energy conversion, Water quality, Erosion control, Reservoir design, Reservoir sites, Water supply development, Water storage, Damsites, Dam design.
Identifiers: Groundwater systems, Biological effects, Federal Disaster Relief Act, Sub-surface reservoirs, Archeological sites, Environmental benefits, *Environmental impact statement.

The Los Angeles Department of Water and Power proposes to construct a dam and reservoir, along with appurtenant works, to restore the predisaster design capacity, including flood protection, of the Van Norman dams and reservoirs destroyed or damaged during the 1971 San Fernando Earthquake. The principal component of the proposed project will be a dam and reservoir having a total capacity of approximately 10,000 acre feet. The proposed structure will be located on the Van Norman complex in Northern San Fernando Valley in Los Angeles County, California. Approximately 50 percent of the construction work of the major component of the project has been completed to date. Long-term adverse impacts will result in the areas of topography, biological features, community concerns, and potential archeological sites. Long term benefits will occur in the areas of daily and emergency water supply systems, biological setting, flood control and protection, water quality, soils and erosion, and recreational facilities. The impacts and benefits are addressed in detail in this Environmental Impact Statement (EIS). Six alternatives to the project were considered and are also treated in detail in the EIS. (Reinders-Florida)
W76-07357

ACHIEVING FEDERAL-STATE COORDINATION IN COASTAL RESOURCES MANAGEMENT,
Louisiana State Univ., Baton Rouge. Sea Grant Legal Program.
For primary bibliographic entry see Field 6E.
W76-07359

MEANS FOR SHOWING AND/OR DETOURING WATER CURRENTS AND THE PREPARATION THEREOF,
Rhone-Poulenc S.A., Paris (France). (Assignee).
Y. Gaudard.
U.S. Patent No. 3,938,339, 3 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol. 943, No 3, p 1106, February 17, 1976.

Descriptors: *Patents, *Coastal structures, *Jetties, *Coastal engineering, *Shore protection, Currents(Water), Waves(Water), Bodies of water, Fabric.
Identifiers: Unwoven fabric.

A stable jetty is arranged angularly in relation to the edge of a body of water so as to slow down and/or detour the currents. It is composed of a pile of fill whose base rests in an excavation surrounded by an unwoven fabric. The unwoven fabric is laid in the excavation and allowed to hang over the edge. The fill is placed in and above the excavation and the fabric is laid over the fill. A spunbonded type unwoven fabric is made up of continuous filaments which are arranged at random throughout the layer. The filaments are of synthetic materials such as polyesters, particularly ethylene polyterephthalate, or polyamides such as polyhexamethylene adipamide, polycaproamide and the like. The fill making up the body of the jetty is generally a material found on site such as sand, gravel or the like. Cohesion of this material can advantageously be assured by a chemical binder which can be, cement, bitumen, lime or polymerizable resins. The chemical binder is introduced into the fill so as to form a regular, reinforced layer, surrounding the body of the jetty above the excavation. The wave breaking elements at the top of the jetty are made up of traditional materials such as stone or shaped objects of cement or concrete. When shaped objects are used, they are in the form of paving stones that are regularly aligned and cemented together on a grill of plastic or on a synthetic fabric. The role of these objects is to simultaneously protect the jetty and to absorb the shocks created by the waves. (Sinha-OEIS)
W76-07432

8B. Hydraulics

EXPERIMENTAL STUDIES OF WING-WALL MIXING CONTROL,
Illinois Univ. at Urbana-Champaign. Dept. of Civel Engineering.
For primary bibliographic entry see Field 5B.
W76-06814

GUIDELINES FOR MONITORING SHORE PROTECTION STRUCTURES IN THE GREAT LAKES.
Coastal Engineering Research Center, Fort Belvoir, Va.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA-009 500, $4.00 in paper copy, $2.25 in microfiche. Miscellaneous Paper 2-75, February 1975. 38 p, 11 fig, 3 tab, 10 ref, 2 append.

Descriptors: *Shore protection, *Great Lakes, *Beach erosion, Structures, Coastal structures, Groins(Structures), Retaining walls, Breakwaters, Sea walls, Engineering structures, Surveys, Monitoring, Erosion, Erosion control, Lakes.

The extent of wave damage to shores is difficult to predict; it is advisable to observe the behavior of the shore to determine if some protective action is required. After installation of a shore protection structure it is important to continue monitoring shore behavior; and also to inspect for structural changes to determine if the structure is functioning as designed. Optimum and minimum plans for recording shoreline changes and monitoring groins, seawalls, revetments, and offshore breakwaters were given. Simple shore erosion computations and a data analysis program were presented. (Sims - ISWS)
W76-06922

AUTOMATED WET SAND FEEDER FOR OPEN-CIRCUIT FLUMES,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
M. G. Foley, and E. F. Dalv.
Journal of the Hydraulics Divisien, Proceedings of American Society of Civil Engineers, Vol. 102, No. HY1, p 136-138, January 1976. NSF GK31802, Army DAHC04-74-G-0189.

Descriptors: *Flumes, *Sands, Laboratory equipment, Sediment transport, Sedimentation rates, Sediments, Sediment load, Hydraulic models, Hydraulics.
Identifiers: *Open-circuit flume, Sand feeders, Simulated-flood experiments, Wet sand feeder.

Movable-bed sediment transport experiments in open-circuit flumes require that sand be fed into the flume inlet. Previous sand feeders have required the use of dry sand for accurate input rates. Sand recovery and reuse is necessary in open-circuit simulated-flood experiments now in progress in the W.M. Keck Hydraulics Laboratory, Pasadena, California, because of the high transport rates used. The large amount of sand recycled makes drying between experiments impractical, requiring that the recovered sand be fed wet. The programmable wet sand feeder developed for these experiments was described. Accurate feeding of damp or wet sand requires a straight-walled storage hopper with sand removed from the entire bottom surface of the sand mass. The feeder described uses a set of scrapers attached to sprocket-driven roller chains to remove sand from the bottom of the hopper. When used with an accurately controlled variable-speed drive moter this feeder has a feed rate reproducibility of + or -0.5%. (Lee - ISWS)
W76-06936

GETTING THE MOST OUT OF AN INFILTRATION/INFLOW ANALYSIS,
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 5D.
W76-06985

DRAINAGE STUDY: HUNTER BROOK SUCKER BROOK, COLDSPRING BROOK,
O'Brien and Gere Engineers, Inc., Syracuse, N. Y.
For primary bibliographic entry see Field 4A.
W76-07090

SPILLWAY FOR LITTLE GOOSE DAM, SNAKE RIVER, WASHINGTON, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville Oreg. Div. Hydraulic Lab.
R. L. Johnson, and L. Z. Perkins.
Available from the National Technical Information Service, Springfield, Va., 22161 as AD/A-01 347 $6.00 in paper copy, $2.25 in microfiche. Technical Report No. 114-1, April 1975. 126 p, 7 fig, 18 tab.

Descriptors: *Model studies, *Hydraulic models, *Spillways, *Washington, Spillway crests, Energy dissipation, Settling basins, Dams, Structures, Riprap, Open channel flow, Hydraulics.

Identifiers: *Little Goose Dam(Wash), *Snake River(Wash), Roller buckets.

The spillway for Little Goose Dam, designed to pass discharges up to 850,000 cfs (2125 cfs per ft of crest), was studied in a 1:42.47-scale, 3-bay, sectional model and a 1:100-scale general model to investigate the performance of various elements of the structure and to determine flow conditions in the tailrace. Maximum velocities that fluctuated between 5 and 12 fps along the north embankment upstream from the spillway were indicated by the spillway model. The contraction coefficient for the north abutment was found to be 0.0465 at the project design discharge of 850,000 cfs and head of 65.5 ft. The capacity of the spillway was in close agreement with the computed value. Pressures on the spillway surface were positive for flows lower than 600,000 cfs and were above -15 ft of water during a discharge of 850,000 cfs. Some pressures along the piers 1 ft above the ogee were negative for discharges higher than 450,000 cfs; the minimum pressure at 850,000 cfs was -26 ft. Modifications to increase pressures on the crest and piers were not undertaken because of the remote possibility of flows higher than 400,000 cfs. Tests indicated that the stilling basin of original design was not satisfactory. An acceptable stilling basin was developed in the model, but unusual artesian flow at the site would have required a costly drainage system to protect the basin slab against uplift. Sixteen roller bucket plans were investigated in efforts to eliminate the basin slab and drainage system. A modified Angostura-type bucket, with simpler teeth and shorter apron, was adopted. (Sims - ISWS)
W76-07094

LITTLE GOOSE DAM, SNAKE RIVER, WASHINGTON, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8A.
W76-07095

DYNAMIC BEHAVIOR OF BOX-GIRDER JETTIES,
Queen Mary Coll., London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8A.
W76-07208

HYDRAULIC MODELING OF SHALLOW COOLING PONDS,
Iowa Inst. of Hydraulic Research, Iowa City.
For primary bibliographic entry see Field 5G.
W76-07212

THE SLIDES IN THE SAN FERNANDO DAMS DURING THE EARTHQUAKE OF FEBRUARY 9, 1971,
California Univ., Berkeley.
H. B. Seed, K. L. Lee, I. M. Idriss, and F. I. Makdisi.
Journal of the Geotechnical Engineering Division, Vol. 101, No. GT7, Proceedings of the American Society of Civil Engineers, Proceedings paper No. 11449, p 651-688, July 1975. 23 fig, 2 tab, 15 ref.

Descriptors: *Dams, *Earthquakes, *Landslides, Finite element analysis, Sand boils, Analytical techniques, Hydraulics, Reservoirs, Downstream, Upstream, History, Effects, Embankments, *California.
Identifiers: *Geotechnical engineering, Field investigations, Scarps, San Fernando Valley(Cal), Dynamic response analyses, Pseudostatic analyses.

The February 9, 1971 earthquake in San Fernando Valley, California, caused slides in the embankments of two old adjacent hydraulic fill dams. At the 140-foot high Lower dam, the entire upstream face slid into the reservoir leaving only 5 feet of freeboard. At the 65-foot high Upper dam, the entire embankment from the waterline to the downstream toe moved downstream 6 feet, leaving a scarp just below the reservoir level on the upstream face. It is concluded that the slide in the lower dam resulted from the development of an extensive zone of liquefaction near the base of the embankment. Some liquefaction is also believed to have occurred in the Upper dam; however, since a significant body of the sand in the upstream and downstream shells of this dam retained considerable strength, complete failure could not occur and the movements were limited in extent. Conclusions are presented concerning the applicability of analytical procedures for predicting the failure and movements that occurred. (Bell-Cornell)
W76-07220

PREDICTION OF WIND WAVE HEIGHTS,
Ecole Polytechnique Federale de Lausanne (Switzerland). Laboratoire d'hydraulique.
H. T. Falvey.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 100, No. WW1, p 1-12, February 1974. 4 fig, 20 ref.

Descriptors: *Coastal engineering, *Hydrodynamics, *Waves(Water), *Winds, Meteorology, Energy, Lakes, Ocean, Engineering, Oceanography, Probability, Statistical methods, Equations, Evaluation.
Identifiers: Aerodynamics, *Boundary shear, *Wave height, *Spectrum analysis, Transfer concepts, Momentum balance, Wind profiles, Differential equations, Water roughness.

Descriptions of the process by which energy from wind blowing over water is transferred into the water to create waves have been gradually becoming very complicated. A method of predicting wave heights as a function of wind velocity and fetch is developed which avoids the necessity for describing the complex transfer mechanism in detail. The method is based on simplified macroscopic momentum balance equations written for the air boundary layer. The loss of momentum in the air is assumed to be completely converted into the creation of waves. The resulting equations agree well with standard forecasting curves. (Bell-Cornell)
W76-07229

WOVEN PLASTIC CLOTH FILTERS FOR STONE SEAWALLS,
Moffatt and Nichols, Long Beach, Calif. Coastal Engineering Dept.
For primary bibliographic entry see Field 8C.
W76-07230

SIMULATION OF PIERS IN HYDRAULIC MODELS,
Manchester Univ. (England). Department of Civil Engineering.
D. J. Ball.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings paper No. 10313, Proceedings of the American Society of Civil Engineers, Vol. 100, No. WW1, p 23-34, February 1974. 10 fig, 10 ref.

Descriptors: *Estuaries, *Harbors, *Hydraulic models, *Hydrodynamics, *Jetties, Drag, Equations, Structures, Simulation analysis.
Identifiers: *Piezoelectric crystals, *Similitude, River Mersey(England).

Two new methods are proposed for the simulation of piers and similar complex structures in hydraulic models. The methods are based on similarity of parameters formed by modification of the hydrodynamic drag equation and are intended for use when scale models do not provide the required resistance to flow due to lack of similarity of Reynolds numbers. A description is given of the application of these methods to the simulation of oil terminal structures in a hydrodynamic model of the River Mersey estuary. The difficulties of estimating drag forces on complex structures are examined and attention is drawn, in particular, to interference effects on drag forces on elements of complex structures and to blockage effects in laboratory testing of model structures. (Bell-Cornell)
W76-07231

8C. Hydraulic Machinery

SETTLING TANKS.
For primary bibliographic entry see Field 5D.
W76-06990

FLUORIDATION ENGINEERING MANUAL,
Environmental Protection Agency, Washington, D. C. Div. of Water Supply.
For primary bibliographic entry see Field 5F.
W76-07031

SIMPLIFIED OPTIMIZATION OF WATER SUPPLY SYSTEM,
Nielsen and Rauschenberger A/S, Lyngby, Denmark.
For primary bibliographic entry see Field 4A.
W76-07144

LARGE PISTON MANURE PUMPS AND OUTSIDE MANURE STORAGES (EARTHEN BASINS),
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-07172

STATE-OF-THE-ART OF GEOTHERMAL RESERVOIR ENGINEERING,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-07209

WOVEN PLASTIC CLOTH FILTERS FOR STONE SEAWALLS,
Moffatt and Nichols, Long Beach, Calif. Coastal Engineering Dept.
J. W. Dunham, and R. J. Barrett.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings paper No. 10325, Proceedings of the American Society of Civil Engineers, Vol. 100, No. WW1, p 13-22, February 1974. 6 fig, 1 tab, 5 ref.

Descriptors: *Coastal engineering, *Filters, *Rocks, *Sediments, *Waves(Water), Erosion, Retaining walls, Sands, Sea walls, Structures, Design.
Identifiers: *Shortages, Filter materials, Revetments.

Plastic cloth filters have been used in relatively small seawalls and revetments, and in conjunction with various types of retaining structures, to prevent leaks through joints, weepholes, etc., with excellent results over the past 15 years. Their use in conjunction with large stone seawalls now gives promise of retaining the material behind them more positively than has been possible with rock-product filters alone. Guidelines for the proper placement of the filter cloth and stone in such structures are presented. (Bell-Cornell)
W76-07230

THE HELICAL BEND COMBINED SEWER OVERFLOW REGULATOR,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.

W76-07246

8D. Soil Mechanics

CONSTRUCTION AND PERFORMANCE OF THE HESS CREEK EARTH FILL DAM, LIVENGOOD, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N. H.
O. W. Simoni.
The Northern Engineer, Vol. 7, No. 3, p 23-34, Fall 1975. 28 fig, 9 ref.

Descriptors: *Dams, *Earth dams, *Hydraulic-fill dams, *Alaska, Permafrost, Cold regions, Dam design, Dam construction, Dam foundations, Refrigeration, Structures, Hydraulic structures, Soil mechanics, Spillways, Outlet works, Tunnels, Diversion tunnels, Hydraulics.
Identifiers: *Hess Creek earth fill dam(Alas), *Livengood(Alas).

The construction of dams in arctic and subarctic regions of the Northern Hemisphere has been rare. The Hess Creek Dam, located about 8 mi northeast of Livengood, Alaska, is one of the few known large earth-fill dams that has been constructed in the permafrost regions of North America. The effect of dams on the underlying permafrost and their settlement and stability characteristics in permafrost are generally unknown. The Hess Creek Dam is a combination hydraulic fill and rolled-earth fill structure containing about 479,000 cu yd of earth fill. A steel sheet pile cut-off wall runs along the base centerline. A 48-in diameter metal pipe outlet with a control gate was installed through the embankment at one end and a spillway, 1300 ft long and 100 ft wide, was built to accommodate flood flow. A refrigeration system was installed at the base to insure the refreezing of the thawed soil. The upstream face was protected with riprap stone. Available evidence, twenty years after completion, indicates that the earth fill embankment had little or no detrimental effect on the permafrost underlying the center-line of the dam. The spillway required a protective surface against scouring. The past performance and present condition of the Hess Creek Dam suggest that construction of earth fill embankments on permafrost is feasible and practical. (Sims - ISWS)
W76-07085

PROPERTIES OF SOIL IN THE SAN FERNANDO HYDRAULIC FILL DAMS,
California Univ., Berkeley.
K. L. Lee, H. B. Seed, I. M. Idriss, and F. I. Makdisi.
Journal of the Geotechnical Engineering Division, Vol. 101, No. GT8, Proceedings of the American Society of Civil Engineers, Proceedings paper No. 11527, p 801-821, August 1975. 14 fig, 3 tab, 26 ref.

Descriptors: *Dams, *Embankments, *Hydraulics, *Soil properties, *California, Alluvium, Compaction, Density, Sands.
Identifiers: *Geotechnical engineering, Cyclic loads, *Hydraulic fill dams, Penetration, Relative density.

Results are presented of extensive field and laboratory tests on soils from two old hydraulic fill dams that were damaged during the February 9, 1971 San Fernando earthquake. The data include standard penetration, absolute and relative compaction, relative density, static strength, and cyclic triaxial test results for both the hydraulic fill silty sand and the natural silty and gravelly sand alluvium. The relative densities of the hydraulics fills ranged from about 51%-58% and the relative compaction ranged from about 85%-92% of Modified AASHO maximum density. The relative density of the alluvium was about 65%-70%. Other properties were consistent with previously published data from other similar soils at similar densities. (Bell-Cornell)
W76-07219

MARINE SOIL MECHANICS,
Norwegian Geotechnical Inst., Oslo.
O. Eide.
Publication No. 103, 1974. 20 p, 40 ref.

Descriptors: Offshore platforms, *Soil mechanics, Soil surveys, Coastal structures, Bottom sampling, Storage tanks.
Identifiers: *Marine soil mechanics, Offshore structures, Marine deposits, Ocean bottom samplers, Underwater surveys.

This report is a review of some of the more important areas of offshore foundation engineering based on current experience at the Norwegian Geotechnical Institute. It discusses the various methods of investigation, equipment, and boring and sampling techniques used in marine soil surveys. Geology of the North Sea and soil conditions of the sea floor are described. The main problems to be studied in designing foundations for gravity platforms are examined in the following areas: Contact between structure and sea floor, stability against sliding and overturning for static load, installation of platform, settlement, displacement due to static load from a 100-year wave, effect of cyclic loading, dynamic analysis and vibration, scour, and instrumentation of gravity platforms. Special attention is paid to the required safety factors. A discussion of calculated and measured settlement of an oil storage tank is presented. (WES)
W76-07321

STABILITY OF ROCK SLOPES IN MINING AND CIVIL ENGINEERING SITUATIONS,
National Mechanical Engineering Research Inst., Pretoria (South Africa).
For primary bibliographic entry see Field 8E.
W76-07322

PAVEMENT AND SOIL CHARACTERISTICS.
Transportation Research Board, Washington, D.C.
Seven Reports Prepared for the 54th Annual Meeting of the Transportation Research Board, Washington, D. C., Transportation Research Record No. 537, 1975. 81 p.

Descriptors: *Soil mechanics, Conferences, *Paving, Stress, *Soil physical properties, Testing, Testing procedures.

Contents: Permanent Deformation Characteristics of Subgrade Soils due to Repeated Loading, by C. L. Monismith and others. Improved Framework for Predicting Permanent Deformation and Asphalt Layers, by S. F. Brown. Design and Construction of Subbases and Foundations for Pavements, by Chester McDowell. Shell Procedure for Assigning Moduli to Unbound Granular Materials, by Y. T. Chou. Significance of Cyclic Confining Stress in Repeated-Load Triaxial Testing of Granular Material, by S. F. Brown and A. F. L. Hyde. Statistical Analysis of Constrained Soil Modulus, by J. H. Salazar Espinosa and others. Evaluation of Modulus and Poisson's Ratio from Triaxial Tests, by M. H. Farzin and others. (WES)
W76-07323

PAPERS OF INTERNATIONAL CONFERENCES 1972-1974.
Public Works Research Institute, Ministry of Construction, Tokyo, Japan.
Technical Memorandum No. 1023, Part 1, 1975. 334 p.

Descriptors: *Earthquake engineering, Earthquakes, Structures, *Slope protection, Conferences, Design criteria, Seismology.
Identifiers: *Earthquake resistant structures.

Partial contents: Present Condition of Slope Protection Procedures and Stability of Slopes During Rain, by K. Yamamura and K. Kutara. Earthquake Response of Highway Bridges and Its Standardization, by E. Kuribayashi, and others. Earthquake Resistibility of Submerged Tunnels, by S. Ibukiyama. Earthquake Engineering Design of Earth Fills, by K. Yamamura. Earthquake Resistant Design Criteria for Underground Structures, by E. Kuribayashi and T. Iwasaki. Research Project on New Criteria for Earthquake Resistant Design for Over-All Structures, by M. Nagao. Preliminary Survey on Seismology and Earthquake Engineering in the Union of Burma, by E. Kuribayashi. Preliminary Report on Damage of Managua Earthquake, by T. Okubo. Effects of Seismic and Subsoil Conditions on Earthquake Response Spectra, by E. Kuribayashi and others. (See also W76-07325) (WES)
W76-07324

PAPERS OF INTERNATIONAL CONGRESSES 1972-1974.
Public Works Research Institute, Ministry of Construction, Tokyo, Japan.
Technical Memorandum No. 1023, Part 2, 1975. 362 p.

Descriptors: Earthquake engineering, Soil mechanics, Earthquakes, Design, Stress, Structures, Testing.

Partial contents: Effects of Seismic and Subsoil Conditions on Earthquake Response Spectra, by E. Kuribayashi and others. Sea Bottom Excavator Details and Results of Working Performance Test in the Bay of Tokyo, by S. Chida. Design of Pile Foundation Subjected to Lateral Load, by T. Okubo and others. Estimation of Liquefaction Potential by Means of Explosion Tests, by K. Yamamura and Y. Koga. Dynamics of Soil Structures and Ground Response in Earthquake Stress Condition Effects on Dynamic Properties of Soil, by E. Kuribayashi and T. Iwasaki. Investigation of Neogene-Tertiary Dam Foundation in Japan, by R. Okamoto. Stress Condition Effects on Dynamic Properties of Soils, by E. Kuribayashi and others. Dynamic Behavior of a Subsurface Tubular Structure, by E. Kuribayashi and others. An Application of Finite Element Method to Soil-Foundation Interaction Analyses, by E. Kuribayashi and Y. Iida. (See also W76-07324) (WES)
W76-07325

EVALUATION OF EMPIRICAL AND ANALYTICAL PROCEDURES USED FOR PREDICTING THE RIGID BODY MOTION OF AN EARTH PENETRATOR,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8G.
W76-07326

EFFECTS OF ANISOTROPIC VERSUS ISOTROPIC CONSOLIDATION IN CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TESTS OF COHESIVE SOILS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8G.
W76-07327

FIELD INSTRUMENTATION IN GEOTECHNICAL ENGINEERING.
British Geotechnical Society, London (England).
For primary bibliographic entry see Field 8G.
W76-07328

CAUSES OF SLAKING IN ARGILLACEOUS MATERIALS,
California Univ., Berkeley.
For primary bibliographic entry see Field 8G.
W76-07329

8E. Rock Mechanics and Geology

GROUND-WATER LEVELS ON BOSTON PENINSULA, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W76-07119

EARTHQUAKE: CORRELATION BETWEEN PIPELINE DAMAGE AND GEOLOGIC ENVIRONMENT,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 8A.
W76-07124

STABILITY OF ROCK SLOPES IN MINING AND CIVIL ENGINEERING SITUATIONS,
National Mechanical Engineering Research Inst., Pretoria (South Africa).
T. R. Stacey.
CSIR Report ME 1202, May 1973. 217 p.

Descriptors: *Slope stability, Slopes, *Rockslides, Photoelasticity, *Stress analysis, *Finite element analysis.
Identifiers: Excavated slopes.

Results are presented of various investigations concerning the behavior of rock slopes, with the emphasis being placed on the distributions of stresses in the slopes. The investigations have been conducted by using the finite element method of stress analysis. A version of this method was developed for two-dimensional stress analysis of discontinuous rock slopes. To provide suitable problems for analysis by this method, and, as a secondary object, to study the failure behavior of rock slopes in a typical sedimentary rock mass structure, two- and three-dimensional models were tested in a centrifuge. Applications of stability analyses in practical slope stability investigations are described involving a road cut and three open cast mine configurations. It is concluded that the three-dimensional nature of rock slopes is extremely important and cannot be neglected when considering the stability of slopes. (WES)
W76-07322

8F. Concrete

COATING IMMERSED CONCRETE FOR SWIMMING POOLS AND SEWAGE INSTALLATIONS,
P. J. Gay.
Journal of the Oil and Colour Chemists' Association, Vol. 58, No. 7, p 252-257, 1975. 1 fig, 10 ref.

Descriptors: *Sewage treatment, *Concrete, *Construction materials, *Pipes, *Coatings, Tanks, Paints, Waste water treatment.

Requirements for the protection of concrete sewer pipes and sewage treatment tanks are reported. Some of the chemical changes occurring during the curing of concrete are outlined and the mechanism of the corrosive effect of several types of waters on concrete structures is discussed. Structures in sulfate-bearing wet soil should be isolated from the water by a water-proofed and vapor-proofed membrane and the concrete should be a dense mix of low porosity. Surfaces should be painted by a dry mix using a siliceous aggregate and should be free from laitence and scum before painting. If greases or fats will be present as contaminants, chemically cured coatings, such as epoxies, should be applied. (Kramer-FIRL)
W76-06987

DURABILITY OF CONCRETE IN SEAWATER,
California Univ., Berkeley. Dept. of Civil Engineering.
P. K. Mehta, and H. H. Haynes.
Journal of the Structural Division, Vol. 101, No. ST8, Proceedings of the American Society of Civil Engineers, Proceedings paper No. 11516, p 1679-1686, August 1975. 4 fig, 1 tab, 15 ref.

Descriptors: *Structural engineering, *Sea water, *Concrete, *Deterioration, *Durability, Oceans, Breakwaters, Permeability, Cements, Marine biology, Chemistry.
Identifiers: *Los Angeles Harbor(Cal), *Sulfate attack.

Concrete submerged for 67 years in seawater has shown that low permeability concrete is highly durable to sulfate attack; however, more permeable concrete is susceptible to sulfate attack. Large concrete blocks were retrieved off the Los Angeles Harbor breakwater. Concrete blocks of size 69 in. x 69 in. x 42 in. which were retrieved were part of a test program initiated by the Corps of Engineers in 1905. Cores were tested for compressive strength and material deterioration to determine if the concrete was attached by seawater. Results from other reports of sulfate attack on concrete are summarized. It is concluded that for long-time durability of concrete exposed to seawater, a reduced permeability and reduced alkalinity of concrete appear to be as important as low 3 Ca.Al O content of cement. (Bell-Cornell)
W76-07218

PAVEMENT AND SOIL CHARACTERISTICS.
Transportation Research Board, Washington, D.C.
For primary bibliographic entry see Field 8D.
W76-07323

8G. Materials

DESALINATION MATERIALS MANUAL,
Dow Chemical Co., Freeport, Tex.
For primary bibliographic entry see Field 3A.
W76-06801

USING CORRUGATED STEEL TO SLASH SEWER COST BY 12%,
For primary bibliographic entry see Field 5D.
W76-06984

CORRUGATED DRAIN PIPE.
For primary bibliographic entry see Field 5D.
W76-06993

EARTHQUAKE: CORRELATION BETWEEN PIPELINE DAMAGE AND GEOLOGIC ENVIRONMENT,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 8A.
W76-07124

PAVEMENT AND SOIL CHARACTERISTICS.
Transportation Research Board, Washington, D.C.
For primary bibliographic entry see Field 8D.
W76-07323

PAPERS OF INTERNATIONAL CONFERENCES 1972-1974.
Public Works Research Institute, Ministry of Construction, Tokyo, Japan.
For primary bibliographic entry see Field 8D.
W76-07324

PAPERS OF INTERNATIONAL CONGRESSES 1972-1974.
Public Works Research Institute, Ministry of Construction, Tokyo, Japan.
For primary bibliographic entry see Field 8D.
W76-07325

EVALUATION OF EMPIRICAL AND ANALYTICAL PROCEDURES USED FOR PREDICTING THE RIGID BODY MOTION OF AN EARTH PENETRATOR,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
P. F. Hadala.
Miscellaneous Paper No. S-75-15, June 1975. 78 p, 28 ref.

Descriptors: Evaluation, Soils, Penetration, *Testing procedures, Measurement.
Identifiers: *Soil penetration, Projectile penetration.

Presents a comparison of five pretest predictions with the measured rigid body motion of a large penetrator normally impacting the Watching Hill Blast Range at the Defense Research Establishment, Suffield, Ralston, Alberta, Canada, at an impact velocity of about 500 ft/sec. Prediction methods used were evaluated in detail. They included the Sandia empirical penetration formulas, the spherical and cylindrical cavity expansion theories, a viscoplastic force law, and the AVCO differential area force law. The capability of predicting peak rigid body deceleration and maximum penetration within a factor of two of measured test data was demonstrated by several of the methods. However, none of the five proved to be completely satisfactory or to be so superior to the others that it could be recommended for exclusive use in predicting earth penetrating weapon response. (WES)
W76-07326

EFFECTS OF ANISOTROPIC VERSUS ISOTROPIC CONSOLIDATION IN CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TESTS OF COHESIVE SOILS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. T. Donaghe, and F. C. Townsend.
Technical Report No. S-75-13, October 1975. 111 p, 24 ref.

Descriptors: *Cohesive soils, Consolidation, Shear, Soil tests, Soil analysis.
Identifiers: R tests(Soils), Triaxial shear tests.

Results of a series of consolidated-undrained triaxial compression tests performed on normally consolidated and overconsolidated specimens of two clays consolidated both isotropically and anisotropically are presented and analyzed. The specimens were trimmed from samples of Vicksburg Buckshot clay and a clay from the East Atchafalaya Basin Protection Levee project area. Data presented include stress-strain curves, pore pressure observations, final water content distributions within the specimens, and shear strength envelopes based on total and effective stresses. Conclusions and recommendations are given. (WES)
W76-07327

FIELD INSTRUMENTATION IN GEOTECHNICAL ENGINEERING.
British Geotechnical Society, London (England).
A Symposium organized by the British Geotechnical Society, 30 May-1 June 1973, J. Wiley, New York, 1974. 720 p.

Descriptors: *Soil mechanics, Equipment, *Instrumentation, Measurement, Conferences, Testing procedures, Stress, Strain.
Identifiers: *Geotechnical engineering.

Partial contents: The Development and Use of Trial Embankments, by A. W. Bishop and P. A. Green. The Measurement of In-Situ Stress and Strain in Soils, by S. F. Brown. In-Situ Measurements of Earth Pressure and Anchor Forces for a Diaphragm Retaining Wall, by J. Bundred. Observations and Analysis of a Flow Slide in Sand Fill, by D. H. Cornforth, and others. Experiences with

ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS

Instrumentation for Embankment Dam Performance, by A. L. Little. The Detection of Leakage Through the Core of an Existing Dam, by M. T. Lovenbury. Measuring Movements of Embankment Dams, by A. D. M. Penman and J. A. Charles. The Measurement of Pore Pressures with Piezometers, by P. R. Vaughan. Measurement of Ground Strain and Tilt Arising from Mining Subsidence, by B. N. Whittaker and D. J. Forrester. The Behaviour of Stress Measuring Devices in Rocks of Various Properties, by F. T. Williams. Field Instrumentation of Vibroflotation Foundation, by H. Y. Wong. (WES)
W76-07328

CAUSES OF SLAKING IN ARGILLACEOUS MATERIALS,
California Univ., Berkeley.
Y. Moriwaki.
PhD Dissertation, 1975. 291 p, 139 ref.

Descriptors: *Slaking, Wetting, Soils, Clays, Materials testing, Drying, *Clay minerals, Testing procedures, Testing.
Identifiers: Clayey soils, *Argillaceous materials.

Results of slaking tests performed under various conditions and on various argillaceous materials are presented for the purpose of clarifying the mechanisms involved in the slaking of natural clayey materials. Tests to examine the effect of various parameters were conducted on artificially prepared, relatively pure clay samples, containing the three main types of clay mineral (kaolinite, illite and monmorillonite) as well as on samples composed of non-clay minerals (quartz and pyrophyllite). The effect of the following parameters were analyzed: mineralogy, adsorbed cations, electrolyte concentrations of slaking fluid, electrolyte concentrations of pore fluid, pH of the slaking fluid, air evacuation, equilibrium relative humidity, consolidation pressure, and grain size. A description of the various testing apparatus and procedures is included. The state of knowledge concerning the slaking behavior of argillaceous material has been reviewed. Different slaking modes encountered during the tests are summarized and a list of principal conclusions given. (WES)
W76-07329

8I. Fisheries Engineering

FISHERIES IMPLICATIONS OF WATER TRANSFERS BETWEEN CATCHMENTS,
Association of River Authorities (England).
MAFF Hydrological Group.
For primary bibliographic entry see Field 3E.
W76-07108

FISH IMPINGEMENT AT MONTICELLO NUCLEAR PLANT,
Northern States Power Co., Minneapolis, Minn.
L. M. Grotbeck, and J. L. Bechthold.
Journal of the Power Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. PO1, Proceedings paper No. 11409, p 69-83, July 1975. 5 fig, 6 tab, 16 ref.

Descriptors: Fish, *Fishkill, *Hydroelectric power, *Powerplant, *Nuclear powerplants, Fish conservation, Fish migration, Fish passages, Evaluation, River flow, Temperature, Measurement, Pumping, *Minnesota.
Identifiers: Impingement, Power.

To properly evaluate total impact of power generation facilities on aquatic systems, it is necessary to perform site specific fish impingement studies. Intake and screen approach velocities should not be averaged when considering potential screen impingement problems because of wide vertical and horizontal variation in velocity which tend to trap fish. It was estimated that 2,952 fish were impinged during 4 months of sampling with 90.9% of these comprised of black bullheads (Ictalurus melas) and black crappies (Pomoxis nigromaculatus). Distinct relationships can be found between number of impinging fish and river flow, percentage river diverted through the plant, water temperature, and the time of year. For the months of June, July, August, and September, approximately 55% of all impingement occurs in June. (Bell-Cornell)
W76-07211

SIMPLE FLUME FOR GUIDANCE AND IMPINGEMENT STUDIES,
Kramer, Chin and Mayo, Inc., Seattle, Wash.
J. L. Congleton, and R. D. Mayo.
Journal of the Power Division, Proceedings of the American Society of Civil Engineers, Vol. 101, No. PO1, Proceedings paper No. 11416, p 35-42, July 1975. 8 fig.

Descriptors: *Fishkill, *Power, *Powerplants, *Testing, *Flumes, Cooling water fish guiding, Design, Operations.
Identifiers: *Fish screens, *Fishways, Impact, Impingement.

The design and operation of a simple recirculating test flume is described. This inexpensive flume has proven useful in developing design criteria for power plant intake screens. Two series of tests are described to demonstrate use of the flume. One series of tests dealt with a fish guidance device, while a second series produced data relating impingement mortality to approach velocity and impingement time. The application of impingement mortality data to the design of power plant intake screens is analyzed, with several examples included. (Bell-Cornell)
W76-07213

CONTROL OF THE SEA LAMPREY (PETROMYZON MARINUS) IN LAKE SUPERIOR, 1953-70,
Fish and Wildlife Service, Marquette, Mich.
B. R. Smith, J. J. Tibbles, and B. G. H. Johnson.
Great Lakes Fish Comm Tech Rep. 26, p 1-60, 1974.

Descriptors: *Lampreys, Predation, Trout, Fish parasites, *Lake Superior, Lakes, Great Lakes, *Fish control agents, Fish barriers.
Identifiers: Trifluoromethyl-4-Nitrophenol, *Lampricide, Petromyzon-Marinus, Salvelinus-Namaycush, TFM, Electrical barriers.

The sea lamprey (P. marinus) gained entrance into Lake Superior in the early 1940's, and began making drastic inroads on the fish stocks by the early 1950's. Serious efforts to control the parasite began in 1953 with the installation of electrical barriers in streams to block spawning runs. Control measures became much more effective after 1958, when a selective toxicant, the lampricide 3-trifluoromethyl-4-nitrophenol (TFM), was used to destroy larval lampreys in streams. A unique methodology was developed for stream treatments which included surveys to find sea lamprey larvae, bioassays to determine effective lampricide concentrations, analytical techniques to monitor concentrations of lampricide throughout the treatment, and feeder systems to apply the toxicant in controlled amounts. Evidence of successful control was indicated first by reduced sea lamprey spawning runs, as measured by the numbers of adults taken at electrical barriers. The runs declined in 1962 by about 86%; periodic re-treatments of lamprey-infested streams held the population at a low level in 1963-70. Other indicators of success were decreases in the incidence of sea lamprey wounds on lake trout (Salvelinus namaycush), in the numbers of sea lamprey larvae in streams and in the number of streams regularly used by sea lampreys for spawning. Although sea lamprey control and heavy plantings of hatchery-reared stock had restored lake trout abundance to pre-lamprey levels in many areas by 1970, the trout had not yet become self-sustaining. Additional effort will be required to further reduce the effects of lamprey predation.--Copyright 1974, Biological Abstracts, Inc.
W76-07250

WATER QUALITY AND BIOASSAY STUDY FROM CRAWFORD NATIONAL FISH HATCHERY,
Chadron State Coll., Nebr.
For primary bibliographic entry see Field 5C.
W76-07257

NATURAL REPRODUCTION OF THE WHITE AMUR IN BODIES OF WATER OF THE LOWER VOLGA, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
K. V. Martino.
Gidrobiol Zh. 10(1), p 91-93, 1974.

Descriptors: *Reproduction, *Fish stocking, Fish behavior, Spawning, Larvae, Fry.
Identifiers: *Ctenopharyngodon-Idella, *USSR(Lower Volga), *White amur.

Systematic stocking of the Lower Volga with fingerlings of the white amur (Ctenopharyngodon idella) began in 1964 after the 1st experimental release of this fish yielded favorable results. Investigations in 1971 and 1972 revealed that natural reproduction has begun in white amur which have matured in the Lower Volga. In all, 937 samples containing 34,036 larvae or early fry were examined. Data are given on the spawning and schooling behavior of the amur.--Copyright 1975, Biological Abstracts, Inc.
W76-07295

THE IMPROVEMENT OF THE ECOLOGICAL CONDITIONS IN FRASINET POND--INTENSELY OVERRUN BY MACROPHYTES AFTER HAVING STOCKED IT WITH GRASS CARP (CTENOPHARYNGODON IDELLA (VAL)), (IN GERMAN),
Institutul de Cercetari si Proiectari Aliment., Bucharest (Rumania).
V. Cure.
Arch Hydrobiol Supplementb. 44(3), p338-351, 1974.

Descriptors: *Carp, Vegetation, *Fish stocking, Ponds.
Identifiers: Ctenopharyngodon-Idella, Frasinet pond, *Grass carp, *Macrophytes.

The effects of introducing grass carp into a pond heavily overgrown with vegetation are described. Improvement was evident after 1 yr, grass carp having been put in at the rate of 70 2-yr-olds/ha.--Copyright 1975, Biological Abstracts, Inc.
W76-07296

THE FISH FAUNA OF THE DJERDAP IMPOUNDMENT IN THE FIRST YEAR AFTER FORMATION, (IN GERMAN),
Bioloski Institut, Belgrade (Yugoslavia).
D. Jankovic.
Arch Hydrobiol Supplementb. 44(3), p364-371, 1974.

Descriptors: *Fish, Carp, *Anadromous fish, Impoundments, Reservoirs.
Identifiers: *Cyprinid fish, Danube River, *Yugoslavia(Djerdap impoundment).

The study and the survey of the changes occurring in the reservoir formed by damming the Danube River at the Iron Gates are of scientific and practical importance. The migration of anadromous fish species from downstream is obstructed; those in the lake migrate into the upper part with faster flow or into the mouths of the tributaries, whereas

the cyprinid fish species become adapted successfully to the newly created conditions.--Copyright 1975, Biological Abstracts, Inc.
W76-07297

FORMATION OF THE FISH FAUNA OF THE CHIMKURGAN RESERVOIR IN THE BASIN OF THE KASHKADAR'YA RIVER (UZBEK SSR, USSR), (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.
For primary bibliographic entry see Field 02H.
W76-07399

STUDY OF THE ZOOPLANKTON OF SMALL LAKES OF THE LOWER REACHES OF THE ISFAIRAMSAI RIVER, (IN RUSSIAN),
Ferganskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
For primary bibliographic entry see Field 02H.
W76-07412

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

BOOKS ON WATER AND WASTEWATER.
National Center for Scientific and Technical Documentation, Brussels (Belgium).
(1975), 102 p.

Descriptors: *Bibliographies, *Water resources, Water quality, Water supply, *Waste water treatment, Wastes, Sewage, Desalination, Publications, Hydrology, Chemistry, Engineering, Groundwater.

This list of 1060 references to books, monographs, and reports on water and wastewater is representative of published literature on this subject during the last decade. References are classified alphabetically by author or organization; a subject index is provided to facilitate searching.
W76-06816

SAN FRACISCO BAY AND DELTA SYSTEM: A SELECTED BIBLIOGRAPHY,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 02L.
W76-06912

SELECTED BIBLIOGRAPHY OF TERRESTRIAL, FRESHWATER, AND MARINE RADIATION ECOLOGY,
Washington State Univ., Pullman. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W76-06913

10F. Preparation Of Reviews

THE ENVIRONMENTAL IMPACT OF FERTILIZERS,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 05B.
W76-07100

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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5 WATER QUALITY MANAGEMENT AND PROTECTION

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 15
AUGUST 1, 1976

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 15
AUGUST 1, 1976

W76-07451 -- W76-08100

he Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the ansaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W76-07563

WATER MOVEMENT THROUGH SATURATED-UNSATURATED POROUS MEDIA: A FINITE-ELEMENT GALERKIN MODEL,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 2F.
W76-07569

DIGITAL MODEL OF THE GRAVEL AQUIFER, WALLA WALLA RIVER BASIN, WASHINGTON AND OREGON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2F.
W76-07593

RUNOFF STUDIES ON SMALL WATERSHEDS,
West Virginia Univ., Morgantown. Water Research Inst.
J. C. Burchinal.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-252 933, $3.50 in paper copy, $2.25 in microfiche. Information Report 4, (WRI-WVU-76-02) 1976. 12 p, 2 ref. OWRT A-003-WVA(4). 14-01-0001-1417.

Descriptors: *Evapotranspiration, *Model Studies, *Peak discharge, *Small watersheds, *Storm runoff, Agricultural runoff, Agricultural watersheds, *Demonstration watersheds, Hydrology, Methodology, Rainfall, Rainfall-runoff relationships, Runoff, Surface runoff, *West Virginia.

Three small experimental watersheds were constructed in 1966. The watersheds cover about 10, 15, and 46 acres, and none contained a stream. Long-term data collection and a series of basic studies on this size watershed began. This report chiefly covers the results of two of these studies - (1) model selection for frequency analysis of runoff data and (2) evapotranspiration as a function of meteorological conditions and soil water. The model of Gumbel proved to be the most preferred and that of Gringorten the least. Adaptations were made for small watersheds in West Virginia. Relationships between actual evapotranspiration, potential evapotranspiration, soil moisture, available water, net radiation, pan evaporation, and other factors were established for the watersheds. Ninety-two percent of the variation in actual evapotranspiration could be accounted for by using potential evapotranspiration and available water as the independent variables in a multiple regression equation, giving a standard error of 0.11 inches. The methodology was specially adapted to analysis of very small watersheds in West Virginia. (Dodson-West Virginia)
W76-07673

PREDICTING SNOWMELT RUNOFF USING A DETERMINISTIC WATERSHED MODEL WITH STOCHASTIC PRECIPITATION INPUTS,
Arizona Univ. Tucson. School of Renewable Natural Resources.
W. Hanes.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-252 858, $5.00 in paper copy, $2.25 in microfiche. M. S. Thesis, 1975. 83 p, 17 fig, 8 tab, 32 ref, 3 append. OWRT B-032-ARIZ.(22) 14-31-0001-3858.

Descriptors: Watershed management, *Decision making, *Water yield, *Snowmelt, *Model studies, Forecasting, Stochastic processes, Synthetic hydrology, *Runoff forecasting, Data processing, Simulation analysis, Precipitation(Atmospheric).
Identifiers: *Stochastic analysis.

The accuracy of currently used long-term runoff forecasting techniques, such as used by the Soil Conservation Service, are limited because of their inability to deal with the uncertainty in the amount of precipitation expected to fall after the forecast date. The basis for a simulation-based, long-term runoff forecasting technique is developed to overcome this problem by simulating future precipitation events. The technique utilizes a deterministic watershed snowmelt model and a sequence, event-based stochastic precipitation model to provide daily precipitation data inputs for the watershed model. A number of sets of inputs are run through the watershed model to produce an equal number of predictions of total seasonal runoff. A relative frequency distribution of total seasonal runoff is then plotted to which a PDF may be fitted. Various criteria were used to test the precipitation model. The majority showed no significant differences between the observed and simulated data. The lack of data prevented reasonable watershed model optimization and testing. Taking into consideration the poor watershed model response the forecasting technique responded will to the uncertainty in future precipitation and to abnormal monthly precipitation.
W76-07764

CLIMATOGICAL ESTIMATES OF EVAPOTRANSPIRATION,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 2D.
W76-07772

SEASONAL VARIATIONS AND STATIONARITY,
Iceland Univ., Reykjavik. Science Inst.
G. Gudmundsson.
Nordic Hydrology, Vol. 6, No. 3, p 137-144, 1975. 2 tab, 9 ref.

Descriptors: *Analysis, *Hydrologic data, *Time series analysis, Seasonal, *Variability, Evolution, Discharge measurement, Temperature, Precipitation(Atmospheric), Climates, Groundwater, Rivers, Thawing, Discharge(Water).
Identifiers: *Seasonal variations, *Stationarity, *Iceland, Evolutionary spectra.

A method was presented for testing second order stationarity against the alternative that seasonal variations take place in the autocovariance function. This was a modification of a test suggested by Priestly and Rao (1969) based on the concept of 'evolutionary spectra'. The method was applied to actual series of monthly data of discharge, temperature, and precipitation. Seasonal variations in mean and variance were eliminated before the test was applied, but highly significant seasonal variation was still present in some series. The observations had to be carried out over an interval of time long enough to enable satisfactory estimation of the relevant statistical process. Also, the second order properties of the series had to be almost constant during the interval of observations. (Roberts - ISWS)
W76-07784

SYNTHETIC MONTHLY RUN-OFF RECORDS FOR UNGAUGED BRITISH CATCHMENTS,
Northumbrian River Authority, Gosforth (England).
For primary bibliographic entry see Field 4A.
W76-08010

KARST AND PALEOHYDROLOGY OF CARBONATE ROCK TERRANES IN SEMIARID AND ARID REGIONS WITH A COMPARISON TO HUMID KARST OF ALABAMA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-08044

HYDROLOGY OF THE NORTH CASCADES REGION, WASHINGTON: 1. RUNOFF, PRECIPITATION, AND STORAGE CHARACTERISTICS,
Geological Survey, Tacoma, Wash.
L. A. Rasmussen, and W. V. Tangborn.
Water Resources Research, Vol 12, No 2, p 187-202, April 1976. 10 fig, 7 tab, 6 ref.

Descriptors: *Streamflow forecasting, *Hydrology, Hydrologic data, *Washington, Equations, Data collections, Evaluation, Methodology, Stream gages, Ice, Snow, Altitude, Topography, Physical properties.
Identifiers: *North Cascade region(Wash).

The time and space distributions of measured precipitation and measured runoff and of spring storage, which is approximately equal to the subsequent summer runoff of snowmelt and stored groundwater, have been analyzed for the North Cascades region of Washington. Neither precipitation nor runoff shows a consistent relationship with altitude, chiefly because of precipitation-shadowing effects in this region of high relief. The relationship between mean annual precipitation and altitude is improved considerably when a topographic mean altitude is used instead of the actual altitude of the weather station. However, the improvement is not sufficient to explain a number of discrepancies that still occur. Some of the scatter in a precipitation-altitude plot appears to be due to a deficient precipitation catch by high-altitude gages. When the dependence of runoff on precipitation was examined on an annual, seasonal, and monthly basis, only a few low-altitude gages correlated well with basin runoff. In several instances, annual (water year) runoff could be better predicted from winter precipitation than from annual precipitation. (See also W76-08060) (Woodard-USGS)
W76-08059

HYDROLOGY OF THE NORTH CASCADES REGION, WASHINGTON: 2. A PROPOSED HYDROMETEOROLOGICAL STREAMFLOW PREDICTION METHOD,
Geological Survey, Tacoma, Wash.
W. V. Tangborn, and L. A. Rasmussen.
Water Resources Research, Vol 12, No 2, p 203-216, April 1976. 4 fig, 8 tab, 19 ref.

Descriptors: *Streamflow forecasting, *Model studies, *Hydrology, *Meteorology, *Washington, Methodology, Hydrologic data, Regression analysis, Hydrologic cycle, Snow, Ice, Rainfall.
Identifiers: *North Cascades region(Wash).

On the basis of a linear relationship between winter (October-April) precipitation and annual runoff from a drainage basin (Rasmussen and Tangborn, 1976) a physically reasonable model for predicting summer (May-September) streamflow from drainages in the North Cascades region in Washington was developed. This hydrometeorological prediction method relates streamflow for a season beginning on the day of prediction to the storage (including snow, ice, soil moisture, and groundwater) on that day. The spring storage is inferred from an input-output relationship based on the principle of conservation of mass: spring storage equals winter precipitation to the basin less winter runoff from the basin and less winter evapotranspiration. The method of prediction is based on data only from the years previous to the one for which the prediction is made,

and the system is revised each year as data for the previous year become available. Standard precipitation and runoff measurements in the North Cascades region are adequate for constructing a predictive hydrologic model. This model can be used to make streamflow predictions that compare favorably with current multiple regression methods based on mountain snow surveys. This method has the added advantages of predicting the space and time distributions of storage and summer runoff. (See also W76-08059) (Woodard-USGS)
W76-08060

DESIGN FLOOD SYNTHESIS BY EXCESS RAIN ROUTING,
Witwatersrand, Johannesburg, Africa, Department of Civil Engineering.
S. W. Bauer, and D. C. Midgley.
The Civil Engineer in South Africa, Vol. 17, No. 8, p 199-202, August 1975. 4 fig, 3 tab, 5 ref.

Descriptors: *Design blood, *Floods, *Rainfall, *Routing, Equations, Hydrographs, Reservoir storage, Drainage, Evaluation, Design storm, Maps, Hyetographs, Systems analysis, Africa.
Identifiers: South Africa.

Trials of several routing procedures for hydrograph synthesis revealed that routing of the excess rain hyetograph through a single linear reservoir-type storage could yield a plausible direct runoff hydrograph provided the shape and drainage pattern of the catchment was not abnormal. The method requires evaluation of only one parameter, the routing constant K, to define the hydrograph for an excess rain of given depth and duration. K values were determined for 92 South African catchments by seeking best-fits between routed and observed unitgraphs. To aid estimation of K for ungauged catchments, the country was subdivided into veld-type zones for each of which a relationship between K and area of catchment is provided. A worked example demonstrates the method. (Bell-Cornell)
W76-08075

FLOOD PEAK ESTIMATES FROM SMALL RURAL WATERSHEDS,
Federal Highway Administration, Washington, D. C.
D-C Woo.
Public Roads, Vol. 38, No. 3, p 117-122, December 1974. 1 fig, 18 ref.

Descriptors: *Highways, *Drainage, *Estimating, *Floods, *Hydrographs, Streams, Flood peak, Hydrologic data, Rural areas, Design, Simulation analysis, Research, Runoff, Rainfall.

The design of highway drainage structures depends on accurate estimates of flood hydrographs of streams that cross highways. This article describes the special characteristics of small rural watersheds and the Federal Highway Administration's extensive involvement in a program of small-stream gaging, data analysis, and methods development for such estimates. Available data on rainfall and streamflow from small rural watersheds are insufficient, and the geographical distribution of streamflow data is extremely poor. These conditions greatly hamper progress toward development of accurate general methods for estimation of flood peaks from small rural watersheds for nationwide use. However, better method for estimation of flood peaks can be developed for local use on the basis of marginal local data by researchers who know the area well. Accurat and sound methods of estimating flood peaks from small rural watersheds must be developed. This will require action on several fronts. The current program of national rainfall and streamflow data collection for small rural watersheds should be greatly expanded. Methods of generating more adequate local rainfall data should be studied. The best stratification schemes for regional analysis should be identified and accurate regional and local models should be developed. (Bell-Cornell)
W76-08077

2B. Precipitation

THERMAL SHOCK AS AN ICE MULTIPLICATION MECHANISM. PART I. THEORY,
New England Univ., Armidale (Australia). Dept. of Physics.
W. D. King, and N. H. Fletcher.
Journal of the Atmospheric Sciences, Vol. 33, No. 1, p 85-96, January 1976. 8 fig, 28 ref, 2 append.

Descriptors: *Ice, *Crystals, *Drops(Fluids), Rime, Physical properties, Cloud physics, *Thermal stress, Model studies, Mathematical models, Temperature, Precipitation(Atmospheric), Meteorology, Elastic theory.
Identifiers: *Ice crystal fractures, Thermoelastic theory.

Thermoelastic theory was used to calculate thermal stresses in ice crystals of idealized shapes when a small area on one surface is warmed to 0C, in simulation of riming of the crystal by a cloud droplet. It was shown that a typical riming event involving a 20 micrometer diameter droplet impinging on a 500 micrometer plate or column would need to occur at a temperature colder than -35C before fracture could be expected. For a given ice crystal size, the thermal stresses increase with droplet diameter, and thin thin plates rimed by large droplets are the most sensitive to thermal shock, but still need to be coler than -10C before fracture would occur. It was consequently concluded that the thermal shock mechanism is unlikely to be responsible for the proliferation of ice crystals in clouds at temperatures as warm as -4C. (See also W76-07548) (Sims - ISWS)
W76-07547

THERMAL SHOCK AS AN ICE MULTIPLICATION MECHANISM. PART II. EXPERIMENTAL,
New England Univ., Armidale (Australia). Dept. of Physics.
W. D. King, and N. H. Fletcher.
Journal of the Atmospheric Sciences, Vol. 33, No. 1, p 97-102, January 1976. 8 fig, 3 ref.

Descriptors: *Ice, *Crystals, *Drops(Fluids), Rime, Physical properties, Cloud physics, *Thermal stress, Laboratory tests, Temperature, Precipitation(Atmospheric), Meteorology, Testing procedures.
Identifiers: *Ice crystal fractures.

Thermal shock tests were conducted on large numbers of ice spheres and plates, all of macroscopic size. The thermal shock was applied by cooling the specimens to the desired temperature, and then rapidly warming part of one surface by bringing water in contact with it. The spheres had a median cracking temperature of -16C, and comparison with thermoelastic theory yielded tensile strength values for ice in the range 20-30 bars. Initiation of cracking in thick plates was a function of the temperature and of the ratio a/b (ratio of radius of warmed area to that of the cylindrical plate). For a/b=0.6, -20C was the critical temperature, but for a/b less than 0.2, which is a more appropriate scaling factor in terms of riming of cloud particles, the samples had to be colder than -35C before any cracks appeared. None of the samples fragmented or separated. Because the experimentally applied temperature changes were more severe than would be experienced by rimed ice crystals in clouds, it was concluded that thermal shock is unlikely to be an important ice multiplication mechanism at -5C. (See also W-76 07547) (Sims - ISWS)
W76-07548

WARM RAIN, GIANT NUCLEI AND CHEMICAL BALANCE-A NUMERICAL MODEL,
National Center for Atmospheric Research, Boulder, Colo.
T. Takahashi.
Journal of the Atmospheric Sciences, Vol. 33, No. 2, p 269-286, February 1976. 17 fig, 64 ref. NSF GA-41024, ONR N00014-67-A-0387-0015.

Descriptors: *Model studies, *Cloud physics, *Rainfall, *Salts, Nucleation, Raindrops, Particle size, Tropical regions, Mathematical models, Clouds, Precipitation(Atmospheric), Condensation, Atmospheric physics, Chemistry of precipitation, Meteorology.
Identifiers: *Warm rain, *Giant nuclei, Raindrop size distributions, Terminal velocity, Liquid water content, Cloud droplet distributions, Salt content.

The role of giant nuclei in initiating warm rain was studied in a one-dimensional, time-dependent cylindrical model. Drop growth from cloud nuclei to raindrops through condensation and collection was calculated by keeping track of the salt mass in drops and by including scavenging of particles by drops. Drop distribution and salt content in rainwater were in reasonably good agreement with observations. It appears that while giant nuclei are important for chemical balance during cloud development, they are not important for warm rain initiation. Instead, cloud droplet concentration seems to be a more critical factor in initiating warm rain. (Sims - ISWS)
W76-07549

CLIMATOLOGICAL IMPLICATIONS OF MICROPARTICLE CONCENTRATIONS IN THE ICE CORE FROM 'BYRD' STATION, WESTERN ANTARCTICA,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 2C.
W76-07551

PITTSBURGH RAINWATER ANALYSIS BY PIXE,
Pittsburgh Univ., Pa.
For primary bibliographic entry see Field 5A.
W76-07555

SMALL SCALE TOPOGRAPHICAL INFLUENCES ON PRECIPITATION,
Norwegian Defense Research Establishment, Kjeller.
P. B. Storebo.
Tellus, Vol. 28, No. 1, p 45-59, 1976. 11 fig, 5 tab, 14 ref.

Descriptors: *Rainfall, *Precipitation(Atmospheric), *Topography, Orography, Rainfall disposition, Rain drops, Fallout, Nucleation, Model studies, Mathematical models, Computer models, Cloud physics, Meteorology.

Small clouds may form above small hills when moist air blows over a landscape. Removal of droplets from these clouds by raindrops from above is the only suggested mechanism which directly links rainfall patterns to small scale topographical features. This mechanism was examined theoretically, and results from a series of computations were presented. The properties of condensation nuclei were found to be of minor importance for the condensation development, because the activation of nuclei dwindles off when enough droplets have been formed, and because a droplet assembly is an instable phenomenon. Additional rainfall over small hills was found to be sufficiently large to explain observed influences of small scale terrain features on precipitation in Scandinavia. (Sims - ISWS)
W76-07556

THE BEHAVIOR OF LARGE, LOW-SURFACE-TENSION WATER DROPS FALLING AT TERMINAL VELOCITY IN AIR,
Little (Arthur D.), Inc., Cambridge, Mass.
R. T. Ryan.
Journal of Applied Meteorology, Vol. 15, No. 2, p 157-165, February 1976. 12 fig, 23 ref. DAHCO-07-C-0061.

Descriptors: *Drops(Fluids), *Raindrops, *Laboratory tests, Settling velocity, Equipment, Laboratory equipment, Surface tension, Surfactants, Meteorology.
Identifiers: *Vertical wind tunnels, Drop breakup, Drop shape, Drop size, Terminal velocity.

A vertical wind tunnel was constructed to study the behavior of large, low-surface tension drops in free fall. The tunnel is simple, but provides a low turbulence (0.7%) flow which stably supports large water drops falling at terminal velocity. The influence of reduced surface tension on maximum drop size, drop terminal velocity, and drop shape was investigated. It was found that drops of low surface tension break up at a smaller size than drops with normal surface tension, are more deformed than drops of equal mass having normal surface tension, and have a lower terminal velocity than drops of equal mass and normal surface tension. Drops only partially coated with surfactant cannot be stably supported and undergo violent oscillations. Before any field testing of possible cloud modification by reducing rainwater surface tension is warranted, further investigation of the behavior of low-surface-tension drops should be undertaken and, in particular, the behavior of drops only partially coated with surfactant should be studied. (Sims - ISWS)
W76-07560

DETERMINATION OF THE FREQUENCY OF PRECIPITATION IN EXCESS OF DESIGN CRITERIA AT MORE THAN A SINGLE LOCATION DURING A HYDROLOGIC SEASON,
Missouri Univ., Columbia. Dept. of Atmospheric Science.
W. L. Decker.
Available from the National Technical Information Service Springfield, Va 22161, as PB-252 816, at $6.00 in paper copy $2.25 in microfiche. Completion Report, December 1975. 129 p, 28 fig, 16 tab, 53 ref, 3 append. OWRT A-078-MO (1) 14-31 0001 - 5025

Descriptors: Precipitation(Atmospheric), *Rainfall, *Design criteria, *Precipitation excess, *Illinois, *Distribution patterns, Correlation analysis, Simulated rainfall.
Identifiers: Extreme value rainfall, Storm rainfall.

The exact and asymptotic distributions of the extreme value were considered for estimating the probability of excessive rains. By plotting the cumulative distributions on extreme probability paper and through the use of Kolmogorov-Smirnov test statistics, it was shown that the annual daily maximum rainfall from an area like Central Illinois fits the Fisher-Tippet type I distribution. The aerial decay of correlation coefficients in Central Illinois was studied by the use of 12 years data from 49 stations in the East Central Illinois Network. From these correlation coefficients it was possible to compute the parameter 'm' required in the bivariate extremal distribution. In the bivariate analysis, 'm' measures the degree of association between annual daily maximum rainfall from two locations. Using the computed 'm' values between stations, the joint probability of annual daily maximum rainfall exceeding the design criteria at each of the two locations was computed. Also the computation of conditional probability that one station's rainfall exceeds the design criteria given that the other stations rainfall exceeded its design criteria was also demonstrated. The possibility of applying the method to the joint probability of occurrence for more than two locations (multiple occurrence) was explored.
W76-07581

CLIMATOGICAL ESTIMATES OF EVAPOTRANSPIRATION,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 2D.
W76-07772

ISOTOPIC RATIOS OF RADIORUTHENIUM AND RADIOCERIUM IN RAIN WATER AT OSAKA IN RELATION TO NUCLEAR EXPLOSIONS DURING THE PERIOD OF LATE 1969 TO 1972,
Radiation Center of Osaka Prefecture, Osaka (Japan). Dept. of Physical Instrument.
For primary bibliographic entry see Field 5A.
W76-07961

ESTIMATION OF EVAPOTRANSPIRATION FOR WATER BALANCE STUDIES IN A SEMI-ARID REGION,
Indian Agricultural Research Inst., New Delhi. Div. of Agricultural Physics.
For primary bibliographic entry see Field 2D.
W76-08067

A STUDY OF MAJOR RAIN STORMS OVER AND NEAR MAHI BASIN UP TO KADANA DAM SITE FOR THE EVALUATION OF PROBABLE MAXIMUM DESIGN STORM,
Institute of Tropical Meteorology, Poona (India).
O. N. Dhar, P. Rakhecha, and R. B. Sangam.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 1, p 29-34, January 1975. 2 fig, 5 tab, 16 ref.

Descriptors: *Rain, *Storms, *River basins, Design storm, Dams, Frequency analysis, Estimating, Probability, Maps, Rain gages, Monthly, Annual, Monsoons.
Identifiers: Mahi basin(India), Isohyetal method.

Mean monthly and annual rainfall of the Mahi basin up to Kadana dam site has been worked out by the isohyetal method on the basis of rainfall data of the period 1901-1950. Highest rain depths actually experienced by the Mahi basin up to Kadana dam site during the period 1902 to 1962 were also worked out for 1-, 2-, and 3-day durations on the basis of maximum rainfall experienced during these durations in each year of the above period. Using frequency analysis, return period of the highest rain depths experienced by the basin for different durations were determined. Maximum basin rain depths for the return periods of 500, 1000 and 10,000 years were also worked out on the basis of 61-year data of basin rainfall for the use of design engineers and hydrologists. Intense rainstorms which occurred in and around the basin during the 61-year period were also picked out and most severe rainstorms were selected for transposition over the basin in order to obtain probable maximum rain depths. The July 1927 rainstorm over north Gujarat was found to be the most severe rainstorm over this region and its transposed rain depths were determined. These were then maximized for moisture charge in order to obtain probable maximum rain depths over the Mahi basin. (Bell-Cornell)
W76-08069

2C. Snow, Ice, and Frost

THERMAL SHOCK AS AN ICE MULTIPLICATION MECHANISM. PART I. THEORY,
New England Univ., Armidale (Australia). Dept. of Physics.
For primary bibliographic entry see Field 2B.
W76-07547

THERMAL SHOCK AS AN ICE MULTIPLICATION MECHANISM. PART II. EXPERIMENTAL,
New England Univ., Armidale (Australia). Dept. of Physics.
For primary bibliographic entry see Field 2B.
W76-07548

AN APPROXIMATE ANALYSIS OF MELTING AND FREEZING OF A DRILL HOLE THROUGH AN ICE SHELF IN ANTARCTICA,
Syracuse Univ., N.Y. Dept. of Chemical Engineering and Material Sciences.
C. Tien, and Y-C. Yen.
Journal of Glaciology, Vol. 14, No. 72, p 421-432, 1975. 4 fig, 3 ref, 1 append.

Descriptors: *Antarctic, *Cold regions, *Drill holes, *Ice, Freezing, Melting, Thawing, Mathematical studies, Model studies, Mathematical models, Heat transfer, Heat flow, Heating, Glaciology.
Identifiers: *Ice shelves.

An approximate analysis of the processes of melting and freezing of a drill hole, 500 m depth and 0.15 m in initial radius, through an ice shelf was made. Results were expressed in graphical form showing the time available for experimentation under the hole as a function of heating duration. It was also found that refreezing has a much slower rate than melting. (Sims - ISWS)
W76-07550

CLIMATOLOGICAL IMPLICATIONS OF MICROPARTICLE CONCENTRATIONS IN THE ICE CORE FROM 'BYRD' STATION, WESTERN ANTARCTICA,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
L. G. Thompson, W. L. Hamilton, and C. Bull.
Journal of Glaciology, Vol. 14, No. 72, p 433-444, 1975. 7 fig, 1 tab, 26 ref. NSF OPP71-04063-A02.

Descriptors: *Antarctic, *Paleoclimatology, *Ice, Volcanoes, Dusts, Temperature, Climatology, Laboratory tests, Radioactive dating.
Identifiers: *Ice cores, Ice sheets, Microparticles, Particle concentrations.

The concentration of microparticles in the 2164 m long ice core from 'Byrd' station, Antarctica, varies cyclically. Highest concentrations of 0.65 micrometer diameter microparticles occur where oxygen-isotope studies show lowest paleotemperatures. The age of the bottom ice estimated from microparticle-concentration variations, assuming an annual cycle, is 27,000 years, much less than from oxygen-isotope studies. (Sims - ISWS)
W76-07551

TESTS OF THE CONCEPT OF SECONDARY FROST HEAVING,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
J. P. G. Loch, and R. D. Miller.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1036-1041, November-December 1975. 5 fig, 1 tab, 20 ref. CRREL DA-ENG-27021-72-G32, NSF GK-42050.

Descriptors: *Frost heaving, *Frozen ground, *Frozen soils, Permafrost, Freezing, Frost, Ice, Soil water, Pore water, Soils, Laboratory tests, Laboratory equipment.
Identifiers: Ice lenses.

Heaving tests were conducted with 2-4, 4-8, and 8-16 micrometer soil fractions in special apparatus in which sliding friction (during heaving) was eliminated by confining the specimen as in standard triaxial test apparatus. Maximum pressures developed by heaving exceeded those computed by a primary heaving model (using air intrusion data) by factors as large as 3 to 6. Maximum pres-

sures and rates of heave at constant pressures depended on temperature gradient and were maximal at gradients between 1 and 3C per cm. Comparisons were simplified transport equations for a frozen fringe adjacent to a growing ice lens (the characteristic feature of secondary heaving) indicated that pore ice in the frozen fringe contributes to water transport for lens growth, but this may be offset by plastic counter-flow of ice at large temperature gradients, accounting for the gradient-dependent maxima. Results were interpreted as supporting the concept of secondary heaving. (Sims - ISWS)
W76-07558

RUNOFF STUDIES ON SMALL WATERSHEDS,
West Virginia Univ., Morgantown. Water Research Inst.
For primary bibliographic entry see Field 2A.
W76-07673

GLACIER SURVEYS IN ALBERTA - 1971,
Canada Centre for Inland Waters, Burlington (Ontario); and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
I. A. Reid, and J. O. G. Charbonneau.
Water Resources Branch Report Series No. 43, 1975, 18 p., 10 fig., 6 ref., 15 tab.

Descriptors: *Glaciers, *Surveys, Photogrammetry, Mapping, Profiles, Elevation, *Canada.
Identifiers: *Alberta, Water Survey of Canada, Athabasca Glacier, Saskatchewan Glacier, Mathematical computations, Volumetric change.

Glaciers act as natural regulators, storing water in winter and releasing it in summer. To gain some understanding of this phenomenon and the contribution which glaciers make to streamflow, the predecessors of the Water Survey of Canada began glacier surveys in 1945. The earlier surveys offered some clue to the role of the glacier, but the data collected were not sufficient to provide the overall picture. Following adoption of photogrammetric survey techniques, however, the glacier surveys have evolved to the extent that it is now feasible to produce a series of maps from which the linear, areal, directional and volumetric changes can be determined. The surveys have revealed that the glaciers, in general, are becoming smaller in size; hence the regulation effect is diminishing in the area of ablation. (Environment Canada)
W76-07680

ESTIMATING WATER TEMPERATURES AND TIME OF ICE FORMATION ON THE SAINT LAWRENCE RIVER,
National Oceanic and Atmospheric Administration, Detroit, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2E.
W76-07765

THE SPECIFIC HEAT OF SALINE ICE,
McGill Univ., Montreal (Quebec). Ice Research Project.
B. Dixit, and E. R. Pounder.
Journal of Glaciology, Vol. 14, No. 72, p 459-465, 1975. 3 fig, 2 tab, 5 ref.

Descriptors: *Specific heat, *Ice, *Salinity, Latent heat, Thermal properties, Physical properties, Physical properties, Laboratory tests, Sea ice, Salts.

A calorimetric experiment was performed to determine empirically the dependence of the specific heat of ice with salinity 0-10 parts per thousand over the temperature range from -23 C to the melting point. The experimental results agreed with the theoretical model determined by Schwerdtfeger for calculating the specific heat except within several degrees of the melting point and for very pure ice. (Sims-ISWS)
W76-07776

SOURCE, TRANSPORTATION AND DEPOSITION OF DEBRIS ON ARAPAHO GLACIER, FRONT RANGE, COLORADO, U.S.A.,
Colorado Univ., Boulder. Dept. of Geological Sciences; and Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
M. J. Reheis.
Journal of Glaciology, Vol. 14, No. 72, p 407-420, 1975. 6 fig, 2 tab, 32 ref.

Descriptors: *Glaciers, *Glacial sediments, *Glacial drift, *Colorado, *Rocky Mountain region, Gravels, Rocks, Sands, Till, Sediments, Ice, Cirques, Mountains, Movement, Geomorphology, Rock glaciers, Glaciology.
Identifiers: *Arapaho Glacier(Colo), Debris content.

This study was undertaken to determine the sources of debris and methods of transportation and deposition in and on a small cirque glacier. Data were collected on the amount of debris, stone roundness, the presence of striations and polish, and till fabric. Lichenometry gave relative ages of the tills, and suggested that the Gannett Peak till is of at least three ages and probably overlies Audubon till. Debris originating from subglacial erosion can be differentiated from that from rockfall or avalanches on stone roundness, polish and striations. A maximum of 70% of the present glacial load derives from subglacial erosion, as compared to 88% during the Gannett Peak stade. Rockfall rates are 35-50 cu m/year at present and were 290-485 cu m/year during the Gannett Peak stade. Data on present-day processes and on the volume and age of Gannett Peak moraines can be used to make comparisons on present and past rates of denudation. The denudation rate in the cirque at present is 95-165 mm/1000 year; in the past it was 4920-8160 mm/1000 year. The denudation rate and the glacial effects on debris are comparable to rates from other glacial areas and effects on debris carried by valley glaciers and continental ice sheets. (Sims-ISWS)
W76-07777

QUANTITATIVE STEREOLOGICAL ANALYSIS OF GRAIN BONDS IN SNOW,
Eidgenoessische Institut fuer Schnee- und Lawinenforschung, Davos (Switzerland).
P. R. Kry.
Journal of Glaciology, Vol. 14, No. 72, p 467-477, 1975. 6 fig, 1 tab, 12 ref.

Descriptors: *Snow, *Laboratory tests, *Physical properties, Analytical techniques, Particle size, Crystals.
Identifiers: *Grain bonds, *Stereological analysis, Grain-bond size.

A section-plane preparation technique and an operational definition of a snow grain bond were developed to allow quantitative analysis of bonding in snow structure. Values for three-dimensional grain size, grain-bond size and number density, and related bonding measurements were presented for equitemperature metamorphosed snow. These results from mutually orthogonal planes within a given snow block showed that the assumptions of randomness and isotropy of grain and grain-bond location and orientation, necessary for stereological analysis from one plane, are satisfied to within + or - 10% even after 30% uniaxial plastic deformation of the snow block. The idealization of a grain bond as a circular plane disk yielded self-consistent results. The number of bonds per grain cannot be accurately determined from two-dimensional studies due to variations in the shape and size of snow grains within a given sample. (Sims-ISWS)
W76-07778

THE RELATIONSHIP BETWEEN THE VISCO-ELASTIC AND STRUCTURAL PROPERTIES OF FINE-GRAINED SNOW,
Eidgenoessische Institut fuer Schnee- und Lawinenforschung, Davos (Switzerland).
P. R. Kry.
Journal of Glaciology, Vol. 14, No. 72, p 479-500, 1975. 13 fig, 3 tab, 18 ref.

Descriptors: *Snow, *Physical properties, *Laboratory tests, Compaction, Mechanical properties, Compressive strength, Youngs modulus, Structural behavior, Stress, Strain, Strength.
Identifiers: *Grain bonds, Grain-bond size.

New and felt-like snow was sieved and sintered at a constant temperature in order to produce homogeneous samples of fine, rounded-grain snow with a density in the range 270-340 kg/cu m. The structure of single samples was changed in stages by nondestructive uniaxial compression. This deformation, which amounted to 30%, took place within 8 hours (thus limiting temperature metamorphism). At each stage the Young's modulus was measured quasi-statically and the creep behavior under constant uniaxial compression was recorded. Stereological analysis of sections from the samples provided mean values for both grain-bond and grain properties. The Young's modulus increased with density slightly more strongly than linearly, whereas the low-stress viscosity in unconfined compression increased nearly exponentially for densities less than 380 kg/cu m. The maximum densification resulted in a 15-fold increase in the measured viscoelastic properties. However, the number of grain bonds per unit mass increased linearly by a factor in the range 1.5 to 2 while the average grain-bond size remained constant. It was concluded that only a fraction of the grain bonds in a snow sample transmit an applied stress, and that the new grain bonds formed during the deformation of a snow sample determine the visco-elastic properties of snow. (Sims-ISWS)
W76-07779

ELECTROMAGNETIC REFLECTION FROM MULTI-LAYERED SNOW MODELS,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
W. L. Linlor, and G. R. Jiracek.
Journal of Glaciology, Vol. 14, No. 72, p 501-515, 1975. 12 fig, 2 tab, 16 ref.

Descriptors: *Snow, *Ice, *Measurement, *Remote sensing, Electromagnetic waves, Reflectance, Model studies, Mathematical models, Melt water, Snowpacks, Snow cover, Water resources, Electrical properties, Instrumentation.
Identifiers: *Dielectric properties.

The remote sensing of snow-pack characteristics with surface installations or an airborne system could have important applications in water-resource management and flood prediction. To derive some insight into such applications, the electro-magnetic response of multi-layered snow models was analyzed. Normally incident plane waves at frequencies ranging from 1 to 10,000 MHz are assumed, and amplitude reflection coefficients are calculated for models having various snow-layer combinations, including ice layers. Layers are defined by a thickness, permittivity, and conductivity; the electrical parameters are constant or prescribed functions of frequency. To illustrate the effect of various layering combinations, results were given in the form of curves of amplitude reflection coefficients versus frequency for a variety of models. Under simplifying assumptions, the snow thickness and effective dielectric constant can be estimated from the variations of reflection coefficient as a function of frequency. (Sims - ISWS)
W76-07780

LOW-TEMPERATURE HEAT CONDUCTION IN PURE, MONOCRYSTALLINE ICE,
Universite Scientifique et Medicale de Grenoble (France). Laboratoire de Spectrometrie Physique.
J. Klinger.
Journal of Glaciology, Vol. 14, No. 72, p 517-528, 1975. 6 fig, 23 ref.

Descriptors: *Ice, *Thermal conductivity, *Heat transfer, Crystals, Crystal growth, Growth rates, Laboratory tests, Thermal properties, Physics, Physical properties, Conductivity, Measurement, Glaciology.

The heat conduction of ice single crystals was measured by a steady-state heat-flux method between 1.7 K and 100 K. For temperatures higher than 16 K all experimental points were found to be on the same curve. For temperatures lower than 16 K the heat conduction curves depended on the material of the crystallization vessel, the aging of the sample and the cooling rate between the temperature of the mount (about 260 K) and liquid-nitrogen temperature. No anisotropy could be found for temperatures higher than 9 K. Computer fits were made, based on Callaway's model of heat conduction in dielectric crystals. An attempt was made to explain the observed extrinsic heat conduction by the presence of microstructures in ice. It was shown that heat-conduction measurement can be used to establish a 'quality-list' of samples studied in laboratories. (Sims - ISWS)
W76-07781

ISUA, GREENLAND: GLACIER FREEZING STUDY,
Cold Regions Research and Engineering Lab., Hanover. N.H.
G. D. Ashton.
Available from the National Technical Information Service, Springfield, Va., 22161 as ADA-009 705 $4.00 in paper copy, $2.25 in microfiche. Research Report 334, April 1975. 19 p, 6 fig, 2 tab, 10 ref.

Descriptors: *Freezing, *Glaciers, Movement, *Cooling, Mining, Mining engineering, Drill holes, Shafts(Excavations), Cold regions, Ice, Ice cover, Coolants, Heat transfer, Physical properties.
Identifiers: *Greenland, *Isua(Greenland).

A scheme for cooling the lower portion of the edge of the Greenland ice sheet, which abuts a potential mining operation, was examined. The magnitude of cooling which may be accomplished by drilling a series of holes about the periphery of the mine site was determined as a function of hole size, spacing and time. Refrigeration was accomplished by pumping a coolant downhole in a central pipe, then uphole in an annulus between the pipe and hole wall, and then through a thin-walled pipe exposed to the surface climate above the ice sheet. It was found possible to achieve a temperature change in the ice of the order of -1 C with hole spacings and pumping requirements which are considered reasonable. Other effects were briefly examined and included an estimate of the basal water thickness and flow rates. (Sims - ISWS)
W76-07789

MODEL INVESTIGATIONS OF ICE ENTRAINMENT BENEATH EDGE OF AN COVER ICE.
A. M. Filippov.
Available from the National Technical Information Service, Springfield, Va., 22161, as ADA-009 694 $3.50 in paper copy, $2.25 in microfiche. CRREL Draft Translation 475, May 1975. 8 p, 3 fig, 4 ref. Translated from Trudy Gosudarstvennogo Instituta, No. 201, p 107-114, 1973.

Descriptors: *Model studies, *Ice cover, *Rivers, Movement, Ice jams, Ice-water interfaces, Slush, Drifting(Aquatic), Currents(Water), Ice.

Model investigations of the drawing in of slush and ice under the edge of an ice sheet are a component part of the study of ice-dam and ice-jam formation processes in rivers, as well as a stage in the experimental development of methods for the hydraulic regulation of slush and ice movements. By using this type of research, it is possible to determine the conditions governing the drifting of ice blocks of various lengths, widths and thicknesses under an ice sheet for flows having different hydraulic parameters. (Sims - ISWS)
W76-07790

2D. Evaporation and Transpiration

VARIATION IN EVAPORATIVE POWER ON SLOPES OF DIFFERENT EXPOSURE AND STEEPNESS IN THE USSR,
Ye. N. Romanova.
Soviet Hydrology, Selected Papers, No. 5, p 334-343, 1974. 2 fig, 7 tab, 7 ref. Translated from Transactions of the Main Geophysical Observatory (Trudy GGO), No. 339, p 35-47, 1974.

Descriptors: *Evaporation, *Slopes, *Mountains, *Climates, Physical properties, Solar radiation, Latent heat, Water loss, Climatology, Meteorology.
Identifiers: *USSR.

Study of the characteristics of evaporative power on different slopes is important for the theory of the microclimate and for solving some applied problems in meteorology, agroclimatology, etc. Of all the existing methods for determining evaporative power, the method where evaporative power is determined from the ratio of the net radiation of a wetted surface to the latent heat of vaporization, is most suitable for determining evaporative power on slopes, since it is free of errors in the computation of evaporative power by the other methods in a rugged relief. This is the method used here to compute evaporative power on slopes. Evaporative power was computed for the four major exposures (north, south, east, and west) of slopes with a steepness of 5, 10, 15, and 20 degrees. A gradual increase in evaporative power with increasing slope steepness and from zone to zone was observed on northern and southern slopes. On 5 deg northern slopes, evaporative power decreased by comparison with level areas by 3.5 cm in the excessively wet zone and by 6.5 cm in the arid zone, whereas on the same slopes of 20 deg it was decreased by 15.0 and 28.1 cm, respectively. A similar pattern was observed on southern slopes, but evaporative power on these slopes differed less from that on a level area than on northern slopes: it increased by 17.6 cm on a 20 deg southern slope. (Sims-ISWS)
W76-07554

PROBABILITY STUDIES OF AGRICULTURAL WATER MANAGEMENT IN HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
O. P. Bishnoi.
Indian Journal of Meteorology, Hydroiogy and Geophysics, Vol. 26, No. 1, p 101-104, January 1975. 5 fig, 1 tab, 4 ref.

Descriptors: *Irrigation, *Farm management, *Rainfall, *Evaporation, Precipitation(Atmospheric), Evapotranspiration, Water supply, Planting management, Dry farming, Soil moisture, Drainage, Climatology.
Identifiers: *India.

The probability of water surplus and deficiencies have been utilized in viewing the problems of agricultural water management. For maximization of the yield, the supply system must be based on the amount of water deficits and their durations. At Ambala, maximum water storage capacity is attained only once in 11 years for 150 days duration from July. The Kharif crop of 90 days duration can successfully be taken once in 2 years, the crops of 120 days duration can succeed in 2 out of 5 years, whereas the crops of still longer duration, i.e., 150 days can grow well only once in 3 years without moisture stress. An adequate amount of water is required even during the rainy season at Hissar. During the monsoon months, the drainage capacity of 7 mm/day is desired once in 2 years. The climatic conditions are suitable during July 12 to September 14 and December 15 to February 17 at Ambala once in 2 years for storing the water in anticipation of the demand. (Sims-ISWS)
W76-07770

CLIMATOGICAL ESTIMATES OF EVAPOTRANSPIRATION,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
F. I. Morton.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11974, p 275-291, March 1976. 5 fig, 1 tab, 15 ref, 2 append.

Descriptors: *Climatology, *Evapotranspiration, *Evaporation, Hydraulics, Hydrology, Rainfall, Rivers, Runoff, Model studies, Hydrologic budget, Evaporation pans, Deserts, Irrigated land.
Identifiers: *Climatological observations, Potential evaporation.

Interactions between evaporating surfaces and the overpassing air suggested that potential evaporation responds in a complementary way to changes in the availability of water for evapotranspiration from the surrounding area. Supporting evidence was found in an analysis of dish and pan evaporation data from irrigated areas and adjoining deserts. The concept was used as the basis for a model which provides estimates of evapotranspiration from routine climatological observations without the need for assumptions concerning the soil-vegetation system and its effects on the availability of water. The model was calibrated at climatological stations in desert areas, where the monthly precipitation approximates evapotranspiration, and applied without local optimization of coefficients over a wide range of environments. The versatility of this unorthodox concept was demonstrated by comparing model and water budget estimates of evapotranspiration for 120 river basins in Canada, Ireland, Kenya, and the southern United States. (Roberts-ISWS)
W76-07772

RESISTANCE TO WATER FLOW IN SOIL AND PLANTS, PLANT WATER STATUS STOMATAL RESISTANCE AND TRANSPIRATION OF ITALIAN RYEGRASS, AS INFLUENCED BY TRANSPIRATION DEMAND AND SOIL WATER DEPLETION,
Royal Veterinary and Agriculture Co..., Copenhagen (Denmark). Hydrotechnical Lab.
For primary bibliographic entry see Field 2I.
W76-07958

ESTIMATION OF EVAPOTRANSPIRATION FOR WATER BALANCE STUDIES IN A SEMI-ARID REGION,
Indian Agricultural Research Inst., New Delhi. Div. of Agricultural Physics.
P.S.N. Sastry, and N.V.K. Chakravarty.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 9, p 288-290, September 1975. 1 fig, 2 tab, 10 ref.

Descriptors: *Evapotranspiration, *Water balance, Semiarid climates, Estimating, Irrigation, Scheduling, Monsoons, Evaporimeters, Meteorology.

Derivation of water balance in a region for purposes of irrigation scheduling on an operational basis requires measurement or estimation of potential evapotranspiration (PET). With a view to assess the applicability of the different formulae currently in use, PET obtained during the south west monsoon season over 10-day periods for

three years were estimated using the formulae developed by (a) Penman, (b) Blaney-Criddle and (c) Papadakis. These have been related to the measured values of evaporation from the standard class A-mesh covered pan evaporimeter. It was observed that estimates of PET made by Penman and Blaney-Criddle methods are fairly comparable with the pan evaporation values when they lie between 4 to 5 mm/day which is also incidentally the average pan evaporation value for the Delhi region during the monsoon season. At other values, there is wide disagreement. Estimation of daily PET using Penman's method during the monsoon season in semi-arid environments like the Delhi region is not recommended for computing daily water balance. (Bell-Cornell)
W76-08067

2E. Streamflow and Runoff

FOURMILE RUN LOCAL FLOOD-CONTROL PROJECT, ALEXANDRIA AND ARLINGTON COUNTY, VIRGINIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07469

TOPOGRAPHIC EXPRESSION OF SUPERIMPOSED DRAINAGE ON THE GEORGIA PIEDMONT,
Georgia State Univ., Atlanta. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W76-07553

NUMERICAL CALCULATION OF THE WAVE INTEGRALS IN THE LINEARIZED THEORY OF WATER WAVES,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W76-07565

CHEMICAL CHARACTERISTICS OF THE LOWER KISSIMMEE RIVER, FLORIDA--WITH EMPHASIS ON NITROGEN AND PHOSPHORUS,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5A.
W76-07603

PREDICTING SNOWMELT RUNOFF USING A DETERMINISTIC WATERSHED MODEL WITH STOCHASTIC PRECIPITATION INPUTS,
Arizona Univ. Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2A.
W76-07764

ESTIMATING WATER TEMPERATURES AND TIME OF ICE FORMATION ON THE SAINT LAWRENCE RIVER,
National Oceanic and Atmospheric Administration, Detroit, Mich. Great Lakes Environmental Research Lab.
C. E. Adams, Jr.
Limnology and Oceanography, Vol. 21, No. 1, p 128-137, January 1976. 4 fig, 5 tab, 18 ref.

Descriptors: *St. Lawrence River, *St. Lawrence Seaway, *Freezing, *Water temperature, Forecasting, Heat flow, Heat transfer, Heat balance, Cooling, Ice, Evaporation, Rivers, Navigation, Mathematical models.

Monthly mean heat losses from the surface of the St. Lawrence River during the fall-winter cooling period were determined by an empirical heat budget which incorporated the processes of radiation, conduction, convection, and precipitation. Calculations indicated that the heat loss can be reasonably represented by a simple linear relation with air-water temperature differential. It was suggested however, that the coefficient of proportionality changes with variations in the ratio of radiation to evaporation. An equation was evaluated which relates surface heat loss to temperature decline along the international section of the river. Within the limits of accuracy of the heat loss calculations, the equation provided adequate estimates of water temperature changes for the period of study. The water temperature decline equation was used as the basis for developing a prediction technique which enables river freeze-up estimates to be made as early as 1 October. When observed freeze-up dates were used, predictions for a 6-year period (1965-1970) yielded standard deviations of 4.7, 3.3, and 3.5 days for predictions starting at the beginning of October, November, and December. Observed freeze-up occurred within 2 days of the predicted date in 4 of the 6 years examined. Experimental predictions for two additional years yielded similar results. (Sims-ISWS).
W76-07765

FLOOD ESTIMATION FROM SHORT RECORDS,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia).
For primary bibliographic entry see Field 4A.
W76-07771

SEASONAL VARIATIONS AND STATIONARITY,
Iceland Univ., Reykjavik. Science Inst.
For primary bibliographic entry see Field 2A.
W76-07784

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1975,
Geological Survey, Helena, Mont.
M. V. Johnson, R. J. Omang, and J. A. Hull.
Open-file report, 1976. 204 p, 2 fig.

Descriptors: *Peak discharge, *Small watersheds, *Montana, *Basic data collections, Streamflow, Hydrologic data, Floods, Discharge(Water).

A program to investigate the magnitude and frequency of floods from small drainage areas in Montana was begun July 1, 1955. This, the twenty-first annual report, is primarily a tabulation, by water year, of the annual peak stage and discharge at each crest-stage gaging station. Also, it summarizes the activities and progress made during the 1975 water year. During the 1975 water year 212 gages were operated, 178 east of the Continental Divide and 34 west of the Divide. Substantial peak flows occurred during the water year; however, runoff patterns varied greatly. Along the west side of the Continental Divide high flows in May or June were caused by combined snowmelt and rain. Peak flows in high mountain areas east of the Divide were caused mainly by snowmelt, but in part by rain. In the prairie area peak flows were mostly caused by isolated rainstorms during summer and spring. Peak flow of record was equalled or exceeded at 56 sites. (Woodard-USGS)
W76-08049

HYDRAULIC EFFECTS OF CHANGES IN BOTTOM-LAND VEGETATION ON THREE MAJOR FLOODS, GILA RIVER IN SOUTHEASTERN ARIZONA,
Geological Survey, Sacramento.
For primary bibliographic entry see Field 4C.
W76-08050

HYDROLOGY OF THE NORTH CASCADES REGION, WASHINGTON: 1. RUNOFF, PRECIPITATION, AND STORAGE CHARACTERISTICS,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2A.
W76-08059

HYDROLOGY OF THE NORTH CASCADES REGION, WASHINGTON: 2. A PROPOSED HYDROMETEOROLOGICAL STREAMFLOW PREDICTION METHOD,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2A.
W76-08060

DESIGN FLOOD SYNTHESIS BY EXCESS RAIN ROUTING,
Witwatersrand, Johannesburg, Africa, Department of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-08075

2F. Groundwater

A SIMPLIFIED APPROACH FOR THE ANALYSIS OF UNSTEADY FLOW TO A CAVITY WELL,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
R. S. Kanwar, S. D. Khepar, H. S. Chauhan, and G. Das.
Ground Water, Vol. 14, No. 2, p 101-105, March-April 1976. 3 fig, 1 tab, 9 ref.

Descriptors: *Groundwater, *Model studies, *Wells, *Aquifer characteristics, Aquifers, Hydraulic conductivity, Storage coefficient, Unsteady flow, Drawdown, Hydraulics.
Identifiers: *Cavity wells.

An analytical solution obtained for unsteady flow to a cavity well has been simplified for finding the aquifer characteristics. In the analysis presented, the relationships become fairly simple for the close approximation of the unsteady state solution. The simplified solution is of great importance for finding the values of storage coefficient and hydraulic conductivity. This solution has large important economic implications, since the formation constants of the aquifer can be found without drilling in the aquifer and installing the screens. If the values of S and K found from these relations are fairly satisfactory after a pumping test, the other more expensive methods which require a fully penetrating well may not be needed. (Sims-ISWS)
W76-07561

WATER MOVEMENT THROUGH SATURATED-UNSATURATED POROUS MEDIA: A FINITE-ELEMENT GALERKIN MODEL,
Oak Ridge National Lab., Tenn.
M. Reeves, and J. O. Duguid.
Report ORNL-4927, February 1976. 236 p, 11 fig, 1 tab, 29 ref, 5 append.

Descriptors: *Unsteady flow, *Saturated flow, *Unsaturated flow, *Finite element analysis, *Computer programs, Computer models, Groundwater movement, Porous media, Equations, Infiltration, Seepage, Boundaries(Surfaces), Model studies.
Identifiers: *Galerkin technique, *FORTRAN.

A two-dimensional transient model for flow through saturated-unsaturated porous media has been developed. This model numerically solves the governing partial differential equations, which are highly nonlinear. The model code uses quadrilateral finite elements for the geometrical assembly, bilinear Galerkin interpolation for the spatial integration, and Gaussian elimination for the solution of the resulting matrix equations. In addition to the usual constant-flux and constant-head boundary conditions, the code is capable of applying pressure-dependent boundary conditions at the ground surface. Thus, infiltration into or seepage

from this surface may be simulated. Each element may be assigned different material properties that allow the investigation of layered geologic formations. The report was intended for use as a complete user's manual and contains a listing of the computer code (in FORTRAN) along with both input and output data for two example problems. The results of a computer simulation compared favorably with experimental data obtained from an inclined soil slab at Coweeta Hydrologic Laboratory in North Carolina. The Galerkin finite-element method was found to be superior to the finite-difference method used by previous investigators. By exploiting the flexibility of the finite-element geometrical discretization, the user may easily reduce computer running time by a factor of two. (Visocky-ISWS)
W76-07569

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, 1975--A BASIC-DATA REPORT,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W76-07588

DIGITAL MODEL OF THE GRAVEL AQUIFER, WALLA WALLA RIVER BASIN, WASHINGTON AND OREGON,
Geological Survey, Tacoma, Wash.
R. A. Barker, and R. D. Mac Nish.
Washington Department of Ecology, Olympia, Water-Supply Bulletin 45, 1976. 49 p, 18 fig, 1 plate, 2 tab, 24 ref.

Descriptors: *Groundwater recharge, *Computer models, *Groundwater basins, *Irrigation effects, *Water level fluctuations, Aquifer characteristics, Washington, Oregon, Drawdown, Surface-groundwater relationships, Groundwater movement, Gravels.
Identifiers: *Walla Walla River basin(Wash-Oreg), *Gravel aquifers.

A digital model using a finite-difference technique simulates hydrologic characteristics of a gravel aquifer which underlies about 120,000 acres of the Walla Walla River basin's interior low-land in Washington and Oregon. The gravel aquifer is underlain by a basalt aquifer system and is coupled to an extensive surface network of streams, canals, and springs. The model permits testing of various water-management alternatives involving the spatial and temporal distribution of well pumpage, irrigation application, and surface-water diversion. Trial-and-error simulation of hydrologic phenomena characteristic of the aquifer during typical, recent years (and believed to be applicable for 5-10 years in the future) was used to calibrate the model. Time-dependent fluxes were programmed for each month of the model year on the basis of recently observed local irrigation practices and pumping withdrawals, average crop requirements, and long-term precipitation. The calibrated aquifer hydraulic conductivities range from slightly less than .000155 to .00250 foot per second. Storage coefficients range from 0.1 to 0.25. After beginning the simulation with water levels contoured for January and continuing for 1 year, the calibrated model computed levels to within 10 feet of those originally contoured over about 95 percent of the modeled area--the match was within 5 feet over about 50 percent of the area. (Woodard-USGS)
W76-07593

AQUIFER TESTS IN THE SUMMIT REACH OF THE PROPOSED CROSS-FLORIDA BARGE CANAL NEAR OCALA, FLORIDA,
Geological Survey, Tallahassee, Fla.
C. H. Tibbals.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-021 586, $4.00 printed copy; $2.25 microfiche. Water-Resources Investigations 28-75, August 1975. 42 p, 18 fig, 5 tab, 6 ref.

Descriptors: *Aquifer testing, *Aquifer characteristics, *Canal seepage, *Water pollution, *Florida, Groundwater, Water table aquifers, Canal construction, Boundaries(Surfaces), Hydraulic conductivity, Saline water intrusion, Anisotropy, Heterogeneity, Groundwater recharge.
Identifiers: *Cross-Florida barge canal, *Floridan aquifer, *Marion County(Fla).

The Summit Pool reach of the proposed Cross-Florida Barge Canal will be excavated into the Floridan aquifer at least 12 feet below the water table. Particular areas of concern are 'outflow' areas where water is expected to pass from the canal into the aquifer. Methods are described that deal with unique boundary conditions and aquifer anisotropy at two sites. Extreme aquifer heterogeneity precluded the determination of aquifer coefficients at one of the sites and probably affected the results of the tests at the other two. Therefore, the calculated aquifer coefficients reported should be regarded only as estimates. Calculated coefficients of horizontal hydraulic conductivity ranged from 0.025 to 3,500 gallons per day per square foot and calculated coefficients of vertical hydraulic conductivity ranged from 0.05 to 23,000 gallons per day per square foot. Ratio of horizontal to vertical hydraulic conductivity ranged from 0.09 to 2.9. (Woodard-USGS)
W76-07599

GEOHYDROLOGY OF THE LAKE AREA AT KATHRYN ABBEY HANNA PARK, JACKSONVILLE, FLORIDA,
Geological Survey, Tallahassee, Fla.
G. W. Leve, and M. I. Backer.
Administrative Report, 1976. 27 p, 6 fig, 4 tab.

Descriptors: *Lakes, *Hydrogeology, *Water quality, *Aquifers, *Florida, Parks, Groundwater movement, Inflow, Shallow water, Surface waters, Chemical analysis, Water analysis, Hydrology.
Identifiers: Kathryn Abbey Hanna Park(Fla).

Kathryn Abbey Hanna Park, Fla., is underlain by a shallow aquifer and the Floridan aquifer. The shallow aquifer is composed of two water-yielding zones: the surficial sand and shell beds and the lower sand and shell beds. The water in the Floridan aquifer is lower in mineral concentration than water in the shallow aquifer. The chloride concentration in the Floridan aquifer is about 20 mg/litre and the dissolved-solids concentration is less than 500 mg/litre. Nine shallow lakes investigated in the park intersect the shallow aquifer. They are recharged directly by rainfall and probably by some inflow from the upper part of the shallow aquifer. The southernmost lake periodically receives inflow of saline water from the Intracoastal Waterway through a canal, and the water is more highly mineralized than in the other lakes. Construction of a control structure on the canal would prevent further inflow of water from the waterway and possibly prevent further fish kills in the lake. Two lakes are densely covered with duckweed, and the dissolved-oxygen concentration of the water ranges from 0.6 to 1.3 mg/litre during daytime hours. The quality of water probably can be improved by increasing the circulation of water in these lakes and by artificially recharging the lakes with water from the Floridan aquifer. (Woodard-USGS)
W76-07602

SPRINGS OF PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
H. N. Flippo, Jr.
Pennsylvania Department of Environmental Resources Harrisburg, Water Resources Bulletin No 10, December 1974. 46 p, 2 fig, 3 tab, 19 ref.

Descriptors: *Springs, *Discharge(Water), *Water quality, *Pennsylvania, Aquifers, Water analysis, *Chemical analysis, Data collections, Water pollution sources, Hydrogeology, Water utilization, Water supply, Evaluation.

Discharge and water-quality data, together with other information, are tabulated for 196 selected springs in Pennsylvania. These springs represent discharges of several principal aquifers; however, about half of them flow from Cambrian and Ordovician limestones and dolomites, which give rise to about 90 percent of all springs having discharges in excess of 100 gpm. The large springs are utilized for fish hatcheries, municipal supplies, and other purposes, because of their relatively good quality characteristics. Eleven of the carbonate-aquifer springs discharge 5,000 to 20,000 gpm. The largest spring, on the basis of median discharge, is Nippono (Enchanted) Spring in Lycoming County, which yields about 18,000 gpm. Some large springs are the discharge points of natural underground conduits that are principally fed by streams. The discharge and quality of water from these springs are variable. The quality of some springs has deteriorated in recent decades. High concentrations of sodium, potassium, chloride, nitrate, and fecal-coliform bacteria in recently sampled spring waters indicate contamination and, in some localities, pollution of the major aquifers. (Woodard-USGS)
W76-07604

THE EXTENDED BOUSSINESQ PROBLEM,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
M. A. Collins.
Water Resources Research, Vol. 12, No. 1, p 54-56, February 1976. 5 fig, 1 ref.

Descriptors: *Water table, *Drains, *Groundwater movement, Leakage, Groundwater recharge, Saline water-freshwater interfaces, Aquifers, Groundwater, Continuity equation, Dupuit-Forchheimer theory, Boundary processes, Potentiometric level, Equations, Islands, Depth.
Identifiers: *Boussinesq equation, *Groundwater mound, *Parallel drains, *Saline aquifers, Freshwater lenses, Semipervious layers.

The original Boussinesq problem of the decline of a groundwater mound between parallel drains was extended to include vertical leakage and recharge and cases of freshwater lenses in confined and unconfined saline aquifers. The solution of appropriate continuity equations with some imposed restrictions by variable separation resulted in three distinct flow depth configurations, which could be described analytically. Transient behavior in two of these cases is nonlinear but amenable to exact solution and can be delineated in a (2 mu + beta, sigma + mu) plane, where beta and sigma are leakage and recharge parameters and mu is a separation constant. It was found that similarity solutions, one of which is the originial Boussinesq solution, exist for both decreasing and increasing flow depths. Active and passive influences of boundary conditions were distinguished. Solutions were applied to the evaluation of saline water intrusion in some coastal zones of Long Island, New York. (Visocky - ISWS)
W76-07786

GEOLOGY AND GROUND-WATER RESOURCES OF HETTINGER AND STARK COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 4B.
W76-08043

KARST AND PALEOHYDROLOGY OF CARBONATE ROCK TERRANES IN SEMIARID AND ARID REGIONS WITH A COMPARISON TO HUMID KARST OF ALABAMA,
Geological Survey, Reston, Va.
V. T. Stringfield, P. E. LaMoreaux, and H. E. LeGrand.

Alabama Geological Survey, University, Bulletin 105, 1974. 106 p, 28 fig, 92 ref.

Descriptors: *Karst hydrology, *Arid climates, *Humid climates, *Paleohydrology, Hydrologic aspects, Carbonate rocks, Karst, Environmental effects, Climatic data, Meteorological data, Foreign countries, Australia, Mexico, Africa, *Alabama, Arizona, Reviews, Sinks, Caves.
Identifiers: *Climate effects on Karst.

The contrast in precipitation between humid and arid carbonate regions is reflected in the relative degrees to which karstification is now active in these types of regions. This report describes three carbonate-rock terranes in arid or semiarid regions (Kaibab plaueau in Arizona, Nullarbor Plain on the south coast of Australia, and the Western Desert of Egypt) and compares them with terranes in more humid regions of the United States and with that in the northern part of the Yucatan Peninsula, Mexico. Carbonate-rock areas in Alabama, U.S.A., are described as representative of those in humid climates. Reconstruction of the geologic and hydrologic history of each arid carbonate region reveals that karstification has been preserved from earlier times when the climate was less arid. (Woodard-USGS)
W76-08044

ARTIFICIAL RECHARGE THROUGH A WELL IN FISSURED CARBONATE ROCK, WEST ST. PAUL, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4B.
W76-08046

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--TEXAS-GULF REGION,
Geological Survey, Austin, Tex.
E. T. Baker, Jr., and J. R. Wall.
Available from Superintendent of Documents, Government Printing Office, Washington, D. C., 20402, $2.45 in paper copy. Professional Paper 813-F, 1976. 29 p, 5 fig, 3 plates, 4 tab, 100 ref.

Descriptors: *Groundwater resources, *Available water, *Water quality, *Regional analysis, *Hydrologic data, Water supply, Water yield, Water storage, Aquifer characteristics, Water utilization, Water demand, Conjunctive use, Water resources development, Water rights.
Identifiers: *Texas-Gulf Region.

Groundwater in the Texas-Gulf Region is a large and important resource that can provide a more significant percentage of the total water supply of the region. Total water requirements within the region are projected to rise sharply from 14 million acre-ft (17 cubic kilometres) in 1970 to nearly 26 million acre-ft (32 cubic kilometres) in 2020. About half of the water used in 1970 was groundwater. An estimated total of 1.04 billion acre-ft (1,280 cubic kilometres) of recoverable water containing less than 3,000 mg/litre dissolved solids is stored above a depth of 400 ft (122 metres) in the aquifers of the region. In addition, part of an estimated 3.28 billion acre-ft (4,040 cubic kilometres) of water in storage below 400 ft (122 metres) is recoverable. Although not all of the groundwater in storage is recoverable, a significant amount is available for development; and an enormous quantity is accessible should occasions prompt its use on a time-limited basis. (Woodard-USGS)
W76-08051

AVAILABILITY OF GROUND WATER FOR IRRIGATION ON THE KEKAHAMANA COASTAL PLAIN, ISLAND OF KAUAI, HAWAII,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 4B.
W76-08054

RECORDS OF WELLS, SPRINGS, AND STREAMS IN THE POTOMAC RIVER BASIN, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va.
For primary bibliographic entry see Field 4B.
W76-08055

GEOHYDROLOGIC SIGNIFICANE OF LITHOFACIES OF THE CARRIZO SAND OF ARKANSAS, LOUISIANA, AND TEXAS AND THE MERIDIAN SAND OF MISSISSIPPI,
Geological Survey, Baton Rouge, La.
J. N. Payne.
Available from Supt. of Documents, GPO Wash., D.C. 20402, price $11.00. Geological Survey Professional Paper 569-D, 1975. 11 p, 2 fig, 9 plates, 1 tab, 60 ref.

Descriptors: *Hydrogeology, *Water quality, Lands, *Lithification, *Hydrologic data, Chemical analysis, Groundwater, Water wells, Arkansas, Louisiana, Texas, Mississippi, Maps, Aquifer characteristics, *Sands.
Identifiers: *Lithofacies, Carrizo Sand, Meridian Sand.

The study of the Carrizo and Meridian Sands is the fourth part of an investigation of the geohydrology of the Claiborne Group. The regional dip of the Carrizo and Meridian Sands is into the Desha basin, Mississippi embayment, and gulf coast geosyncline. Some movement of major structural features took place during Carrizo and Meridian time. Normal faulting is rather extensive in southern Arkansas and in Texas. The thickness of the Carrizo and Meridian Sands varies from 0 in areas of nondeposition to a maximum of 700-750 feet in De Witt and Karnes Counties, Tex. Aquifer tests indicate that the coefficient of permeability increases with increase in sand-unit thickness, but the range in values in the Carrizo and Meridian Sands is not as great as the range in values found in the other Claiborne aquifer formations. The areas of highest transmissivity of the formations are in west-central Mississippi and in southern Texas. In Mississipi and Texas the dominant anion is bicarbonate in water from the Carrizo and Meridian Sands from depths of 1,700 to more than 2,500 feet. In Arkansas and Louisiana, chloride is the dominant anion below depths of 500-1,00 feet. (Woodard-USGS)
W76-08061

2G. Water In Soils

EVALUATION OF A SOIL NITRATE TRANSPORT MODEL,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W76-07453

TESTS OF THE CONCEPT OF SECONDARY FROST HEAVING,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
For primary bibliographic entry see Field 2C.
W76-07558

WATER MOVEMENT THROUGH SATURATED-UNSATURATED POROUS MEDIA: A FINITE-ELEMENT GALERKIN MODEL,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 2F.
W76-07569

THE EFFECT OF IRRIGATION ON THE DEVELOPMENT OF DESERT TAKYR SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W76-07580

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES, VOLUME III,
Ontario Inst. for Environmental Studies, Toronto.
For primary bibliographic entry see Field 5A.
W76-07676

EFFECT OF SOIL MOISTURE AFTER YOUNG PANICLE FORMATION STAGE ON MINERAL COMPOSITION IN LOWLAND BROWN RICE, (IN JAPANESE),
National Food Research Inst., Tokyo, (Japan).
For primary bibliographic entry see Field 3F.
W76-07693

COMPARISON OF LABORATORY AND FIELD DETERMINED SATURATED HYDRAULIC CONDUCTIVITY AND PREDICTION FROM SOIL PARTICLE SIZE,
University of the West Indies, St. Augustine (Trinidad). Dept. of Soil Science.
F. A. Gumbs.
Trop Agric. 51(3), p 375-382, 1974.

Descriptors: Analytical techniques, *Instrumentation, *Water table, *Hydraulic conductivity, *Measurement, Soil types, Particle size, Sands, Silts, Clays, *Regression analysis.

A very simple apparatus is described for measuring saturated hydraulic conductivity (SHC) above a water table in the field. The horizontal component of SHC measured by laboratory and field techniques was studied at the 0-30 cm, 30-60 cm, 60-120 cm and 120-180 cm depths at 2 sites about 150 m apart on River Estate sandy loam. The mean laboratory measured values were usually greater (by a factor of 1.5-15) than the field values and replicates were more variable. The soil profiles at the 2 sites differed in appearance and in particle size distribution and this latter influenced the SHC. SHC was significantly positively correlated with the coarse sand content and regression equations involving coarse sand content were good at predicting the SHC as measured in the field. The multiple regression equation of SHC with the four particle sizes (coarse sand, fine sand, silt and clay) had the highest variable proportion for regression but the F ratio was significant only at $P = 0.05$. The simple linear regression (SHC = 0.62 + 0.11% coarse sand) should be adequate for soil survey work and for calculating drain spacing. In this soil type SHC increased markedly as the bulk density decreased from 1.4 g/cm3 (porosity of 48%). A bulk density of 1.4 g/cm3 may be critical for adequate water relations in this soil type.--Copyright 1974, Biological Abstracts, Inc.
W76-07698

THE WILTING POINT AND AVAILABLE MOISTURE IN TROPICAL FOREST SOILS OF NIGERIA,
Ife Univ. (Nigeria). Dept. of Soil Sciences.
A. O. Obi.
Exp Agric. 10(4), p 305-312, 1974.

Descriptors: *Soil moisture, Moisture content, Africa, *Wilting point, *Forest soils, Tropical regions, *Soil water, Crops, Greenhouses.
Identifiers: *Nigeria, Okra, Sunflower.

Availability of soil water was investigated and the methods of determining the lower limit of availability by biotic and standard 15-bar pressure were compared. Greenhouse-grown sunflower and okra were the test crops for the biotic method. The pressure membrane equipment was used for standard 15-bar moisture determination. Okra and sunflower took up water beyond the standard 15-bar tension, thus lowering the moisture content at moderate wilting below the generally accepted values. In topsoil okra wilted at very high tensions, but at somewhat lower tensions in subsoil samples, unlike sunflower which wilted at higher tensions in subsoil samples. An equation is given

which may be used to estimate the moisture content at the moderate wilting point of plants with known wilting tensions.--Copyright 1975, Biological Abstracts, Inc.
W76-07710

DETERMINATION OF SOIL-WATER DIFFUSIVITY FOR ANISOTROPIC STRATIFIED SOILS,
Connecticut Agricultural Experiment Station, New Haven.
B. L. Sawhney, J.-Y. Parlange, and N. C. Turner.
Soil Science Society of America Journal, Vol. 40, No. 1, p 7-9, January-February 1976. 3 fig, 10 ref.

Descriptors: *Soil moisture, *Diffusion, *Soil water movement, Soil physical properties, Soil properties, Soil water, Unsaturated flow, Subsurface water, *Anisotropy, Laboratory tests, Infiltration.
Identifiers: *Stratified soils.

The unsaturated soil-water diffusivity of an anisotropic soil can be described by a second-order tensor. In the particular case of a stratified soil, the diffusivity tensor is defined by the two values of the diffusivity in the principal directions, one normal and one parallel to the soil layer. The standard method of Bruce and Klute then requires the use of two soil columns, one for each direction, to define the diffusivity tensor. The present method made use of a two-dimensional similarity solution first derived for an isotropic medium and extended here to a stratified soil. It was then possible to obtain the diffusivity tensor of the stratified soil from one experiment only. As an illustration of the method, the diffusivity tensor of a mica layer was measured and the result was used to analyze infiltration from a finite trench. (Sims-ISWS)
W76-07767

COMPARISONS OF CALCULATED AND MEASURED CAPILLARY POTENTIALS FROM LINE SOURCES,
Southern Piedmont Conservation Research Center, Watkinsville, Ga.
A. W. Thomas, H. R. Duke, D. W. Zachmann, and E. G. Kruse.
Soil Science Society of America Journal, Vol. 40, No. 1, p 10-14, January-February 1976. 4 fig, 2 tab, 11 ref.

Descriptors: *Soil physical properties, *Capillary action, *Soil water movement, *Irrigation, Capillary water, Soil moisture, Soil water, Infiltration, Hydraulic conductivity, Subsurface irrigation, Subsurface flow, Laboratory tests.

Calculated distributions of capillary potentials were compared with those measured in a soil bin designed to model the water distribution from a subsurface irrigation system. Capillary potentials were computed from mathematical equations developed to model steady infiltration from a distribution of line sources which lie in a horizontal plane and are parallel and equally spaced. Capillary potentials were measured from a steady flow regime created in a soil bin for two soils. This study has shown promise that the equations can predict the capillary potentials in most regions of a soil mass which is irrigated with a subsurface system. (Sims-ISWS)
W76-07768

ASSESSMENT OF SOIL MOISTURE STORAGE FROM RAINFALL AND ITS UTILITY IN RABI CROP PLANNING IN HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
O. P. Bishnoi.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 26, No. 1, p 97-100, January 1975. 4 fig, 5 tab, 6 ref.

Descriptors: *Rainfall, *Soil moisture, *Crops, *Dry farming, Moisture availability, Evaporation, Precipitation(Atmospheric), Climatology, Soil water, Soil-water-plant relationships, Farm management, Planting management.
Identifiers: *India.

An assessment of the accumulated soil moisture has been made during the subnormal, normal and above normal years of rainfall over Haryana State. It was found that the accumulated soil moisture of 20 to 170 mm during the sub-normal years, 50 to 300 mm during the normal years, 100 to 500 mm during the above normal years exist from southwestern zone to the northern region of the state. The Rabi crop planning strategy has been formulated for optimization of the yield with the given quantity of water available due to the existing rainfall patterns. (Sims-ISWS)
W76-07769

PROBABILITY STUDIES OF AGRICULTURAL WATER MANAGEMENT IN HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 2D.
W76-07770

PRELIMINARY OBSERVATION ON SEASONAL CHANGES IN THE SALT CONTENT OF AN IRRIGATED SOIL UNDER WHEAT-MAIZE ROTATION,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
For primary bibliographic entry see Field 3C.
W76-07954

AN IRRIGATION RATING FOR SOME SOILS IN ANTIGUA, W. I.,
Macdonald Coll., Montreal (Quebec).
R. W. Borden, and B. P. Warkentin.
Trop Agric. 51(4), p 501-513, 1974.

Descriptors: *Soils, *Irrigation efficiency, Physical properties, Soil profiles.
Identifiers: Antigua, West-Indies.

Criteria for establishing the irrigation suitability of soils in Antigua, West Indies, were developed by reevaluating criteria developed for temperate climates to take into consideration the soil physical property differences that result from a tropical environment and the specific local conditions. These are essentially the role of texture, structure and drainage, and also the effect of cracking in clays on structure and drainage. Seven potential irrigation sites were investigated and rated, according to the criteria established, on the basis of texture, structure, depth and uniformity of the profile, salinity, alkalinity and drainage. One site was rated as class 1 land, 2 sites were predominantly class 2 land, 1 site was class 3 and 3 sites were dominantly class 4, though these exhibited a high amount of variability. During the detailed investigation of the sites, a number of soil phases and 1 new soil series were added to the catalog of soils on Antigua.--Copyright 1975, Biological Abstracts, Inc.
W76-07963

SOIL COVER OF THE SHERABAD STEPPE, (IN RUSSIAN),
G. A. Tinina.
Probl Osvoeniya Pustyn'. 6, p 24-28, 1973.

Descriptors: *Soils, Grasslands, *Irrigation effects, *Sierozems, *Gray-brown podzolic soils.
Identifiers: Sherabad steppe, *Solonchaks, *USSR, *Takyr soils, Meadows.

The following types of soils are characteristic for the region (USSR): takyr soils of ancient and recent irrigation, takyr soils of past irrigation, irrigated takyr-meadow, meadow gray-brown soils and solonchaks. Agricultural land resources are increased on account of soils of the past irrigation, gray-brown soils and solonchaks.--Copyright 1975, Biological Abstracts, Inc.
W76-07964

THE PHYSICO-CHEMICAL CHANGES OF NEWLY FLOODED SOILS,
Andhra Pradesh Univ., Hyderabad (India). Agricultural Research Inst.
R. M. Badrinarayan, and J. Venkateswarlu.
J Indian Soc Soil Sci. 22(1), p 13-18, 1974.

Descriptors: Soils, *Flooding, *Rice, Manganese, Phosphorus, *Soil chemistry, Iron, Silica, Aluminum.

Changes occurring when soils were brought under low-land paddy for the 1st time were studied. A period of submergence of 2-3 wk appeared to be necessary for obtaining better dry matter production for rice grown under lowland conditions for the 1st time. Green manuring with 2-3wk of submergence further enhanced dry matter production. Submergence of the soils for the 1st time led to an Al concentration of 1.2 to 1.64 ppm which, if not removed through drainage, might be toxic to rice. Si in the leachate was sufficient under submergence for normal growth. The adsorbed Fe, Mg and P generally increased with the period of submergence while K decreased after 3 wk of submergence.--Copyright 1975, Biological Abstracts, Inc.
W76-07980

2H. Lakes

PROCEEDINGS: SECOND WETLANDS CONFERENCE (HELD ON JANUARY 9, 1974 AT STORRS, CONNECTICUT),
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6E.
W76-07451

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 17-3, LONGSHORE WAVE ENERGY ANALYSES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07470

DESIGN WAVE INFORMATION FOR THE GREAT LAKES, REPORT 1, LAKE ERIE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. T. Resio, and C. L. Vincent.
Technical Report H-76-1, January 1976. 148 p, 24 fig, 8 tab, 6 append, 68 ref.

Descriptors: *Great Lakes, *Lake Erie, *Waves(Water), *Wind velocity, Shores, *Shore protection, Model studies.
Identifiers: *Design wave.

Hindcast wave information that is applicable to many planning and design purposes on Lake Erie is presented. Historical wind data from four stations along Lake Erie served as input to the numerical hindcast model, and significant wave heights were calculated for 5-, 10-, 20-, 50-, and 100-yr return periods. These results are provided in tabular form for 24 points along the Lake Erie shoreline. The mean significant period for each of these wave heights is also given. Information is provided for four seasons of the year (January-March, April-June, July-September, and October-December) and is separated into three approach directions relative to shore. (WES)
W76-07473

OUTLET WORKS FOR TAYLORSVILLE LAKE, SALT RIVER, KENTUCKY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07476

DESIGN OF ENTRANCE CHANNEL IMPROVEMENTS FOR LUDINGTON HARBOR, MICHIGAN; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07477

PERSISTENCE OF DIQUAT IN THE AQUATIC ENVIRONMENT,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5C.
W76-07546

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
International Field Year for the Great Lakes (IFYGL) Bulletin No. 17, February 1976. 112 p, 9 fig, 10 tab.

Descriptors: *Great Lakes, *International waters, *International Hydrological Decade, *Canada, *United States, *Lake Ontario, Programs, Publications, Bibliographies, Water temperature, Currents(Water), Lakes.
Identifiers: *International Field Year for the Great Lakes.

Listed were the official International Field Year for the Great Lakes (IFYGL) publications, joint Canadian-U. S. publications included in IFYGL Bulletin No. 16, and additions to the IFYGL bibliography. Abstracts of nine Canadian-authored papers presented at the 17th Conference on Great Lakes Research in August 1974 were given. Information presented for Lake Ontario included monthly mean temperatures and monthly resultant lake currents for May through November. Brief reports on both Canadian and U. S. scientific projects were included. Canadian and U. S. summaries of data available from IFYGL archives were tabulated. (Sims-ISWS)
W76-07563

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 5 - LAKE MICHIGAN AND ITS TRIBUTARIES.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07574

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 5 - LAKE MICHIGAN AND ITS ILLINOIS TRIBUTARIES.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07579

FISH GROWTH RESPONSE TO MECHANICAL MIXING OF LAKE ARBUCKLE, OKLAHOMA,
Oklahoma Cooperative Fishery Unit, Stillwater.
For primary bibliographic entry see Field 5C.
W76-07587

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 2. KING AND SNOHOMISH COUNTIES,
Geological Survey, Tacoma, Wash.
G. C. Bortleson, N. P. Dion, J. B. McConnell, and L. M. Nelson.
Washington Department of Ecology, Olympia, Water-Supply Bulletin 43, Vol 2, 1976. 424 p, 1 fig, 13 ref.

Descriptors: *Lakes, *Lake morphology, *Lake morphometry, *Water quality, *Washington, *Data collections, Bathymetry, *Aerial photography, Lake shores, Mapping, Water analysis, Physical properties, Chemical analysis.
Identifiers: King County(Wash), Snohomish County(Wash).

A total of 156 lakes in King and Snohomish counties of western Washington was sampled using helicopter or boat to obtain information on lake physical, cultural, and water-quality conditions. Physical parameters were determined from topographic and bathymetric (bottom-contour) maps of the lakes. If bathymetric maps were not available, the lakes were sounded and charted using a continuous-recording fathometer. By use of aerial photographs and lake depths, the bathymetric data were digitized and transferred to computer cards which served as input to a computerized program that calculated lake morphometric parameters (for example, lake volume, surface area, and length of shoreline). Vertical profiles of temperature and dissolved oxygen were measured in the deepest part of each lake. Secchi-disc visibility was determined also. Water samples were collected for color, nutrient, and specific-conductance analyses at depths 3.0 feet below the water surface and 3-5 feet above the lake bottom. Samples for fecal-coliform bacteria were collected at selected nearshore sites, approximately 100 feet offshore at a depth of 1 foot below the water surface. (Woodard-USGS)
W76-07591

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 1. CLALLAM, ISLAND, JEFFERSON, SAN JUAN, SKAGIT, AND WHATCOM COUNTIES,
Geological Survey, Tacoma, Wash.
G. C. Bortleson, N. P. Dion, J. B. McConnell, and L. M. Nelson.
Washington Department of Ecology, Olympia, Water-Supply Bulletin 43, Vol 1, 1976. 248 p, 1 fig, 13 ref.

Descriptors: *Lakes, *Lake morphology, *Lake morphometry, *Water quality, *Washington, *Data collections, Bathymetry, *Aerial photography, Lake shores, Mapping, Water analysis, Physical properties, Chemical analysis.
Identifiers: Northwestern Washington lakes.

A total of 89 lakes in six counties (Clallam, Island, Jefferson, San Juan, Skagit and Whatcom) of northwestern Washington was sampled using helicopter or boat to obtain information on lake physical, cultural, and water-quality conditions. Physical parameters were determined from topographic and bathymetric (bottom-contour) maps of the lakes. If bathymetric maps were not available, the lakes were sounded and charted using a continuous-recording fathometer. By use of aerial photographs and lake depths, the bathymetric data were digitized and transferred to computer cards which served as input to a computerized program that calculated lake morphometric parameters (for example, lake volume, surface area, and length of shoreline). Vertical profiles of temperature and dissolved oxygen were measured in the deepest part of each lake. Secchi-disc visibility was determined also. Water samples were collected for color, nutrient, and specific-conductance analyses at depths 3.0 feet below the water surface and 3-5 feet above the lake bottom. Samples for fecal-coliform bacteria were collected at selected nearshore sites, approximately 100 feet offshore at a depth of 1 foot below the water surface. (Woodard-USGS)
W76-07592

GEOHYDROLOGY OF THE LAKE AREA AT KATHRYN ABBEY HANNA PARK, JACKSONVILLE, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W76-07602

CHEMICAL CHARACTERISTICS OF THE LOWER KISSIMMEE RIVER, FLORIDA--WITH EMPHASIS ON NITROGEN AND PHOSPHORUS,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5A.
W76-07603

LAKE ERIE, OHIO, PENNSYLVANIA, NEW YORK INTAKE WATER QUALITY SUMMARY 1972,
Environmental Protection Agency, Fairview Park, Ohio.
For primary bibliographic entry see Field 5A.
W76-07610

CHARACTERIZATION OF LIMNETIC ZOOPLANKTON PHOSPHORUS EXCRETION AND FACTORS AFFECTING TEMPORAL EXCRETION RATES IN THE PHOSPHORUS CYCLE IN A LAKE,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-07675

SURVEILLANCE METHODOLOGY - 1974,
Canada Centre for Inland Waters, Burlington (Ontario); and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5A.
W76-07679

A BOTTOM SEDIMENT TRAP FOR RECENT SEDIMENTARY DEPOSITS,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
For primary bibliographic entry see Field 2J.
W76-07766

TEMPERATURE STEPS IN LAKE KIVU: A BOTTOM HEATED SALINE LAKE,
Massachusetts Inst. of Tech. Cambridge. Dept. of Earth and Planetary Sciences.
F. C. Newman.
Journal of Physical Oceanography, Vol. 6, No. 2, p 157-163, March 1976. 10 fig, 11 ref. ONR N00014-67-A-0204-0048, NSF A30729X.

Descriptors: *Temperature, *Saline lakes, *Heated water, Salinity, Salts, *Water temperature, Geothermal studies, On-site data collections, On-site investigations, Instrumentation, Interfaces, Lakes, Limnology, Profiles, Africa.
Identifiers: *Lake Kivu(Dem Rep of Congo-Rwanda).

Vertical profiles of temperature microstructure in Lake Kivu were obtained with 'mini-microstructure recorders' developed by C.S. Cox and William Johnson at Scripps Institution of Oceanography. The profiles revealed three depth intervals containing many isothermal layers typically 0.25-2 m thick and of increasing temperature increments 0.01-0.03 C from layer to layer. Approximately 150 such layers appeared in a single profile. Double-diffusive convection was assumed and the results of Huppert and of Turner were applied to calculate an upward heat flux of 0.71 to 1.6 W/sq m and a corresponding upward salt flux equal to one-fifth

of the average salt output of the lake's only outflow. The chief source of heat and salt is probably geothermal springs in the lake bottom. (Sims-ISWS)
W76-07774

PROCEEDINGS: LAKE TAHOE RESEARCH SEMINAR II, 27 SEPTEMBER 1974, SANDS VAGABOND CONVENTION CENTER, SOUTH LAKE TAHOE, CALIFORNIA,
Lake Tahoe Area Research Coordination Board South Lake Tahoe, Calif.
For primary bibliographic entry see Field 5G.
W76-07793

THE SCIENTIST AND DECISION MAKING AT LAKE TAHOE,
For primary bibliographic entry see Field 6B.
W76-07795

CLEAN WATER FOR MID-AMERICA.
Federal Water Pollution Control Administration, Chicago, Ill. Great Lakes Region.
For primary bibliographic entry see Field 5G.
W76-07821

REPRODUCTION OF THE BANDED KILLIFISH: FUNDULUS DIAPHANUS DIAPHANUS (LE SUEUR), (IN FRENCH),
Service Faune Auebec, St. Faustin. Station for Pisciculture.
P. Fournier, and E. Magnin.
Nat Can (Que) 102(2), p181-188, 1975.

Descriptors: *Fish reproduction, *Killifishes, Canada, Lakes, Fish population, Gonads.
Identifiers: Banded fish, Funculus-Diaphanus-Diaphanus.

The relationship between gonad weight and total body weight for the female banded killifish F. diaphanus (Le Sueur), indicates that postpawning egg development is slow until spring. With increasing water temperatures in early June, the weight of ovaries and testicles increases rapidly until the spawning season, 6 wk. later. All males and most females in Lakes Stant-Louis and Renaud (Canada) are mature when 2 yr old. Sexual maturity appears to be a function of size rather than age. The minimum lengths at which female banded killifish produced mature eggs, in lakes Saint-Louis and Renaud, were 42 mm and 47 mm, respectively. Females comprise 75% of the population in Lake Saint-Louis and 55% in Lake Renaud. Spawning occurs in both lakes in July lasting a minimum of 3 wk when water temperatures range from 21-23C.--Copyright 1975, Biological Abstracts, Inc.
W76-07937

PRODUCTION OF A SEMI-VOLTINE CHIRONOMID, CHIRONOMUS COMMUTATUS STR., IN LAKE PORT-BIELH (CENTRAL PYRENEES), (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Hydrobiologie.
H. Laville.
Ann Limnol 11(1), p 67-78, 1975.

Descriptors: Lakes, Productivity, Europe, Biomass, *Crustaceans, Brown trout.
Identifiers: Chironomus-Commutatus, Port-Bielh, Pupation, Pyrenees, Salmo-Trutta-Fario, Semivoltine.

The net annual production of C. commutatus was estimated in 1971-72 as 6.29 kg/ha/dry weight, 2nd in importance in the production of the littoral-profundal benthic commuty of the Lake (in France). The value of the ratio P/Bmax (production/maximum biomass) = 1.49 confirms the stability of this ratio, a stability which has been previously shown for several representatives of the benthos and more recently for 2 monocyclic species of Crustacea from the same lake. Of the production, 36% is lost by the ecosystem during the pupation (30%) and emergence of the adults (6%). Brown trout (Salmo trutta fario) utilize 10.5% of the production of C. commutatus when they feed on the ascending pupae; this represents 49 kg/wet weight for the 10.5 ha of the zone between the depths of 7-19 m. -- Copyright 1975, Biological Abstracts, Inc.
W76-07939

BRIEF MICROBIOLOGICAL CHARACTERIZATION OF THE KAYRAKKUM RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.
For primary bibliographic entry see Field 5C.
W76-07941

PHYTOPLANKTON OF THE VLASINA LAKE DURING THE PERIOD 1949-1964, (IN SERBO-CROATIAN),
Institute for Biological Research, Belgrade (Yugoslovia).
D. Milovanovic.
Arh Biol Nauka 25(3/4), p 177-194, 1973(1975).

Descriptors: *Phytoplankton, Lakes, Europe, Bogs.
Identifiers: Sphagnum bogs, *Yugoslavia(Vlasina Lake).

The process of formation of Vlasina Lake (Yugoslavia) in a widely extended sphagnum bog, was studied from early 1949 to the end of 1964. The changes in the physico-chemical water regime and in the formation of phytoplankton populations were established during this 16-yr period.--Copyright 1975, Biological Abstracts, Inc.
W76-07942

A CHARACTERISTIC OF THE LAKES OF THE LECZYNSKO-WLODAWSKIE LAKE DISTRICT BASED ON ABIOTIC ENVIRONMENTAL FACTORS, (IN POLISH),
Marie Curie-Sklodowska Univ., Lublin (Poland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W76-07943

HYDROBIOLOGICAL CONDITION IN THE RESERVOIR-COOLER OF THE LITHUANIAN STATE REGIONAL ELECTRIC POWER STATION, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
For primary bibliographic entry see Field 5C.
W76-07944

THE PRODUCTIVITY OF THE WATERS OF MAR GRANDE AND MAR PICCOLO OF TARANTO (1962-1969), (IN ITALIAN),
For primary bibliographic entry see Field 2L.
W76-07947

PARTICULARS OF SOME SPECIMENS OF ALGAL FLORA OF THE PONDS OF BERRE AND VAINE (BOUCHES-DU-RHONE), (IN FRENCH),
Aix-Marseille-2 Univ. (France). Laboratoire de Biologie Vegetale.
For primary bibliographic entry see Field 5C.
W76-07950

THE GRADIENT OF SALINITY, ITS SEASONAL MOVEMENT, AND ECOLOGICAL IMPLICATIONS FOR THE LAKE IZABAL-RIO DULCE ECOSYSTEM, GUATEMALA,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-07975

MODEL STABILITY, RESILIENCE, AND MANAGEMENT OF AN AQUATIC COMMUNITY,
Washington State Univ., Pullman. Dept. of Zoology.
G. E. Long.
Oecologia (Berl). 17(1), p 65-86, 1974.

Descriptors: *Model studies, *Algae, Population, *Aquatic populations, Stability, Management, Lakes, Environmental effects, *Biological communities, *Ecosystems, Nitrogen, Potassium.
Identifiers: Daphnia-Galeata, Resilience, Verhulst-Pearl logistic model.

A community model may be considered stable when, the absence of exogenous variation, all population trajectories encircle or asymptotically approach equilibrium. Community models in which, in the absence of analytical indications of stability, all populations either exhibit trajectories toward equilibrium or posses properties such that departures from equilibrium are inhibited, will be defined as resilient. The necessary properties include appropriate sensitivity (i.e., the total derivative, dfi/dVj, of the ith species function, fi = dNi/dt, with respect of the jth variable) to exogenous variables. A real, though simplified, ecological system consisting of Daphnia galeate and its algal food source in an oligotrophic lake appears to be generally resilient in that changes in the exogenous factors nitrate concentration and temperature of the lake water consistently restrain the departure of predicted population densities from equilibrium. Each population in the community is represented by the Verhulst-Pearl logistic model of population growth augmented to include environmental effects on rate of increase, r; carrying capacity, K; and the effects of predation on population density, N; and therefore the population rate of change, dN/dt. Such community submodels and sensitivity analysis represent logical and appropriate amplifications in the use of mathematical models in the management of populations.--Copyright 1975, Biological Abstracts, Inc.
W76-07976

THE MERCURY CONTENTS OF FISH FROM CARINTHIAN LAKES, (IN GERMAN),
Bundesanstalt fuer Virusseuchenbekampfung der Haustiere, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-07981

BIOLOGY OF THE CARP IN THE MINGECHAUR RESERVOIR, (IN RUSSIAN),
M. M. Seid-Rzaev.
Izv Akad Nauk Az SSR Ser Biol Nauk 5-6, p 94-99, 1974.

Descriptors: *Carp, Reservoir, Growth rates, Fish reproduction, Fish eggs, Fish populations.
Identifiers: Azerbaijan-SSR, *USSR(Mingechaur Reservoir).

Carp in the Mingechaur Reservoir on the Kura River in the Azerbaidzhan SSR (USSR) reach a length of 70.0 cm and weight of 8040 g. Fish 35-35 cm long and weighing 922-1768 g comprise the bulk of the fish caught. The age of the sexually mature carp varies from 3-10 yr; fish 4-5 yr old predominate in the catch. Since the construction of the reservoir in 1955, significant changes have not occurred in the structure of the carp population. The carp of the Mingechaur Reservoir lag in growth rate behind the carp of other water bodies of the Azerbaidzhan SSR. The fecundity of the carp averages 144,500 eggs.--Copyright 1975, Biological Abstracts, Inc.
W76-07987

PHENOLOGY AND PRODUCTIVITY OF PISTIA STRATIOTES L. ON THE VOLTA LAKE, GHANA,
Ghana Univ., Legon. Dept. of Botany.
For primary bibliographic entry see Field 5C.

W76-08036

LONG-TERM CHANGES IN THE PLANKTON OF LAKE TYRIFJORD, NORWAY,
Kongeliege Norske Videnskabers Selskab, Trondheim. Museet.
A. Langeland.
Norw J Zool. 22(3), p 207-219, 1974.

Descriptors: Lakes, *Phytoplankton, Europe, Zooplankton, Daphnia, Algae, Diatoms, Rotifers, Seasonal.
Identifiers: Cyclops-scutifer, Daphnia-cristata, Diatomeae, Fragilaria-crotonensis, Limnocalanus-macrurus, Mesocyclops-leuckarti, Mesocyclops-oithonoides, *Norway(Lake Tyrifjord), Oscillatoria-rubescens.

Phyto-and zooplankton investigations were carried out in the freshwater Lake Tyrifjord, Norway, from 1957-1973, and the results compared with plankton investigations made in 1930. The phyto-and zooplankton communities had changed both quantitatively and qualitatively, the most important changes being an increased standing crop and biomass of Diatomeae algae and rotifers, decreased occurrence in summer of Limnocalanus macrurus and the likely introduction of new phyto- and zooplankton species such as Oscillatoria rubescens, Fragilaria crotonesis, Daphnia cristata, Cyclops scutifer, Mesocyclops leuckarti and Mesocyclops oithonoides. The present ecological conditions in Lake Tyrifjord may be interpreted as a stage in an incipient eutrophication of the lake.--Copyright 1975, Biological Abstracts, Inc.
W76-08042

OCCURRENCE AND OUTFLOW OF ZOOPLANKTON IN THE KIEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-08090

2I. Water In Plants

EFFECT OF FLOODING ON THE REGENERATION OF SIX TROPICAL GRASSES AFTER DEFOLIATION,
Department of Primary Industries, Brisbane (Australia). Soil Conservation Branch.
For primary bibliographic entry see Field 4A.
W76-07696

A HYDRODYNAMIC APPROACH TO THE MICRODISTRIBUTION OF BENTHIC INVERTEBRATES IN RUNNING WATER, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Hydrobiologie.
H. Decamps, G. Larrouy, and D. Trivellato.
Ann Limnol 11(1), p 79-100, 1975.

Descriptors: *Invertebrates, Benthos, *Distribution, Europe, Larvae, Streams.
Identifiers: *Simuliidae, *France.

The microdistribution of larvae and pupae of 3 spp. of Simuliidae (Odagmia variegata, O. obreptans and Simulium repicolum) was observed in different streams in the Pyrenees (France). These species occur where there is high water velocity which, in the streams studied, was present in zones with torrential discharge. They were not found in zones with a general fluvial discharge. Smooth stones with a diameter greater than about 10 cm are the most frequently colonized substrata. The surfaces facing upstream and slightly inclined carry the greatest densities of larvae. In fast flowing zones with a longitudinal gradient of reduction in velocity, the larvae are concentrated in a narrow band where the velocity is highest. The body of the larva lies in a downstream direction and moves with the pulsations of the current. The larvae of Simuliidae rapidly colonize channels immersed in the stream and it is possible to decline the hydrological conditions at the places where the larvae are attached. The flow varies with time at the same station and the discharge can change from a fluvial type to a torrential type. The profile of currents at the surface (in the zone where the invertebrates are living) can be determined as a function of the relative roughness of the surface. The presence of a laminar film (laminar sub-layer) depends upon the strength of the current and the unevenness of the substratum. For a given current speed, the relationship between the thickness of the laminar film and the index of roughness or uneveness affects the possible formation of a laminar film. The variation in the thickness of the laminar film is a function of current speed. The laminar film has only a small influence on the living conditions of larvae of Simuliidae; turbulence is an important factor. -- Copyright 1975, Biological Abstracts, Inc.
W76-07938

INCIDENCE OF THE TERRESTRIAL COMMUNITIES ON THE SEASONAL REPRODUCTION OF THE TROGLOBITIC AMPHIPOD: NIPHARGUS, (IN FRENCH),
Lyon-1 Univ., Villeurbanne (France). Laboratoire de Biologie Sauterr.
M. J. Turquin.
Bull Soc Zool Fr 100(2), p 169-176, 1975.

Descriptors: *Invertebrates, Ponds, Amphipoda, *Reproduction, Seasonal, Caves.
Identifiers: *Flies, *Niphargus, Troglobites.

Terrestrial invertebrates periodically dropping into pools represent a large food input for the aquatic community of Hautecourt cave (France). The caloric value for flies alone was 300,000 calories (gm-cal)/yr/90m 2 of water. This 'manna' may be a new trigger for seasonal reproduction in aquatic troglobites. -- Copyright 1975, Biological Abstracts, Inc.
W76-07940

CHANGES IN THE MICROPHYTOCENOTIC COMPOSITION OF QUACK GRASS MEADOWS IN THE FLOOD PLAIN OF THE LOWER DON IN DIFFERENT YEARS, (IN RUSSIAN),
Kalmyk State Univ., Elista (USSR).
V. A. Bananova, and B. N. Gorbachev.
Bot Zh (Leningr) 60(3), p 432-437, 1975.

Descriptors: *Flood plains, *Grasses, Succession.
Identifiers: Agropyron-Repens, Beckmania-Eruciformis, Phytocenotic composition, Quack grass, *USSR(Don River).

A 3-yr study of quack grass (Agropyron repens) meadows in the floodplain of the lower Don (USSR) established that the microphytocenotic structure of the quack grass meadow changes markedly depending on the presence or absence of floods. Of the 31 microassociations noted on this meadow, only 8 were found in all years of observation, the others existed only for 1 or 2 yr. In the flood year (1970) the composition of the quack grass association included more hygrophytic slough grass (Beckmania eruciformis)- quack grass microphytocenoses (microcommunities), and in floodless years their area first contracted, then disappeared from the grass stand. The relationship between species in the same microassociation also changed. On the basis of the changes of the microphytocenotic composition of associations in different years it is possible to determine the direction of succession.--Copyright 1975, Biological Abstracts, Inc.
W76-07953

RESISTANCE TO WATER FLOW IN SOIL AND PLANTS, PLANT WATER STATUS STOMATAL RESISTANCE AND TRANSPIRATION OF ITALIAN RYEGRASS, AS INFLUENCED BY TRANSPIRATION DEMAND AND SOIL WATER DEPLETION,
Royal Veterinary and Agriculture Co..., Copenhagen (Denmark). Hydrotechnical Lab.
G. K. Hansen.
Acta Agric Scand. 24(2), p 83-92, 1974.

Descriptors: *Plant-water-soil relationships, *Water requirements, *Transpiration, Resistance, *Grasses, Soil physics.
Identifiers: Italian ryegrass, Lolium-Multiflorum, *Plants, *Rye grass.

Influence of water stress and transpiration demand on relative water content, resistance to water flow in soil and plants, stomatal resistance and transpiration of Italian ryegrass (Lolium multiflorum) was studied in growth chambers. The pooled resistance to water flow in soil and plants, Rs + Rp, determined as the ratio between the water potential drop from soil to leaves and transpiration, was analyzed. Resistance to water flow in soil, Rs, was estimated based on theories of soil physics. Assuming one-tenth, one-fifth and the entire root system acting as an effective sink for water, Rs showed no agreement with the determined Rs + Rp. Correction for Rs for a soil-root interface resistance dependent on soil-water content did not result in any agreement either. Rs at the actual root densities (18 cm cm-3) was not limiting within a range of 0.1-15 bars of soil-water potential (psi s). The relation was independent of the variation in the water potential drop whether it was obtained by change in transpiration demand or by change in soil-water content. The resistance of plants, Rp, decreased with increasing flow rate. No unique relation between Rp and leaf-water potential was found. Stomatal resistance, rs, and transpiration during water stress, related to that of non-stressed plants, T Tm-1, decreased steeply when psi 1 decreased further below -11 bars. Linear correlation between rs-1 and T Tm-1 was found. Copyright 1974, Biological Abstracts, Inc.
W76-07958

THE CHEMICAL COMPOSITION OF ASPARAGUS SHOOTS AS AFFECTED BY SOIL MULCHING, (IN ROMANIAN),
Institutul Agronomic, Bucharest (Rumania).
R. Ciofu.
Lucr Stiint Inst Agron Nicolae Balcescu Bucur Ser B 15, p 309-314, 1972.

Descriptors: *Asparagus, *Plant growth, Vegetable crops, *Mulching, Effects, *Crop response, Amino acids.
Identifiers: Film mulch, Leaf mulch, Sawdust mulch.

The influence of film, sawdust and leaf mulching on the composition of the roots and shoots of asparagus (dry matter, soluble sugar, starch, crude protein, free amino acids, vitamin C) was investigated. Film mulching led to higher yields and better shoot quality.--Copyright 1975, Biological Abstracts, Inc.
W76-07968

MODEL STABILITY, RESILIENCE, AND MANAGEMENT OF AN AQUATIC COMMUNITY,
Washington State Univ., Pullman. Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W76-07976

DYNAMICS OF THE ANNUAL GROWTH OF PINUS SYLVESTRIS L. IN THE TURGAI VALLEY IN CONNECTION WITH CLIMATIC FACTORS, (IN RUSSIAN),
Kustanai Pedigogical Institut (USSR).
P. G. Pugachev.
Bot Zh (Leningr) 60(3), p 401-412, 1975.

Descriptors: *Scotch pine trees, Growth rates, Ecology, Climates, *Dendrochrosology, Forests.
Identifiers: Kazakh-SSR, Steppe, *USSR(Turgai Valley).

A dendroclimatic investigation of the growth of Scotch pine (P. sylvestris) of the insular pine forests in the Turgai valley in the Kazakh SSR (USSR) showed a direct relationship between annual growth and the ecological conditions in different climatic zones, from the forest-steppe to the semidesert. In the vegetation period the amount of precipitation in June-July has a decisive effect on the width of the annual rings of trees. In individual periods certain relationships between growth anomalies and a central form of atmospheric circulation are manifested for pine under steppe and desert conditions. Cycles of 9-11 yr were noted in the long-term growth of pine forests in the dry steppe-semidesert zone; 22-yr growth cycles were noted in trees of the more northern, steppe pine forests.--Copyright 1975, Biological Abstracts, Inc.
W76-07984

DIATOMS OF SOME MINERAL AND THERMAL SPRINGS IN THE CAUCASUS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
N. I. Golovenkina.
Vestn. Leningr Univ Biol 1, p 40-47, 1975.

Descriptors: *Diatoms, *Mineral water, *Hot springs, Water temperature.
Identifiers: *USSR(Caucasus).

Diatoms in mineral and thermal springs with the encountered. The upper temperature of 19-54C were studied: 120 spp. and varieties were encountered. The upper temperature limit of their development in the springs was 38C. Dependence of the species diversity of diatoms on the temperature regime of the spring is established.
W76-07986

EVIDENCE FOR THE SIGNIFICANCE OF CRASSULACEAN ACID METABOLISM AS AN ADAPTIVE MECHANISM TO WATER STRESS,
Bot. Inst., Fac. Biol. Tech. Hoch., Darmstadt, W. Ger.
K. Winter.
Plant Sci Lett. 3(4), p 279-281, 1974.

Descriptors: *Metabolism, *Photosynthesis, Nutrients, *Plant growth, *Growth rates, Temperature, Plant physiology.
Identifiers: Crassulacean-Acid, *Mesembryanthemum-Crystallinum.

Mesembryanthemum crystallinum plants exhibiting C3 pathway of photosynthesis were subjected for 3 wk to nutrient solution of low temperature (10) to reduce the absorption of water. By this stress treatment plant growth was largely retarded and Crassulacean Acid Metabolism (CAM) of photosynthesis was induced.--Copyright 1975, Biological Abstracts, Inc.
W76-08080

THE USE OF OVERWINTER DRAW DOWN FOR AQUATIC VEGETATION MANAGEMENT,
Wisconsin Univ. Extension, Madison. Environmental Resources Unit.
S. A. Nichols.
Water Resources Bulletin, Vol. 11, No. 6, p 1137-1148, December 1975. 5 fig, 6 tab, 8 ref.

Descriptors: *Drawdown, *Winter, *Aquatic plants, *Management, Water quality, Nutrients, Wisconsin, Sampling, Chemical analysis, Vegetation, Fish, Water levels.
Identifiers: Water depth, Stem flow, Mondeaux flowage, Zizania aquatica.

Overwinter drawdown can be a useful technique for aquatic plant management. Its effectiveness depends largely on the susceptibility of nuisance species to drawdown. A single overwinter drawdown provided good control of aquatic plants in a flowage dominated by Potamogeton robbinsii. Little additional control was gained by a second drawdown the following winter. Rapid reinvasion of plants after drawdown ceased dictates continued management. To avoid fish kills caused by low dissolved oxygen levels, caution is advised when using overwinter drawdown. The growth of Zizania aquatica was not negatively influenced by drawdown. The influence on water quality of nutrient release from decaying vegetation and exposed bottom sediments was uncertain. (Bell-Cornell)
W76-08093

2J. Erosion and Sedimentation

DESIGN WAVE INFORMATION FOR THE GREAT LAKES, REPORT 1, LAKE ERIE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2H.
W76-07473

TOPOGRAPHIC EXPRESSION OF SUPERIMPOSED DRAINAGE ON THE GEORGIA PIEDMONT,
Georgia State Univ., Atlanta. Dept. of Geology.
A. C. Staheli.
Geological Society of America Bulletin, Vol. 87, No. 3, p 450-452, March 1976. 4 fig, 6 ref.

Descriptors: *Geomorphology, *Topography, *Drainage patterns(Geologic), *Georgia, Streams, Stream erosion, Coastal plains, Sediments, Geology, Drainage, Sediment transport, Headward erosion.
Identifiers: *Georgia Piedmont, Brevard zone, Stream capture, Sedimentary deposition.

The Brevard zone separates two regions on the Georgia Piedmont that have different drainage styles. Streams on the northwestern Piedmont have trellis drainage, which suggests that they have undergone a different evolution than streams that have dendritic drainage, on the southeastern Piedmont. It was concluded that Coastal Plain sediment covered the southeastern Georgia Piedmont to at least the Brevard zone. Consequent streams developed a dendritic drainage on this cover and became superimposed across buried resistant northeast-trending geologic structures. Trellis drainage, however, developed as a result of subsequent streams being controlled by Piedmont structures on areas of thin or no Coastal Plain sediment cover. (Lee - ISWS)
W76-07553

ESTABLISHMENT OF VEGETATION FOR SHORELINE STABILIZATION IN GALVESTON BAY,
Texas A and M Univ., College Park, Dept. of Range Science.
For primary bibliographic entry see Field 2L.
W76-07567

ENVIRONMENTAL ASPECTS OF RUN-OFF AND SILTATION IN THE ANACOSTIA BASIN FROM HYPERALTITUDE PHOTOGRAPHS,
Maryland Univ., College Park.
For primary bibliographic entry see Field 4D.
W76-07568

MEASUREMENT AND PREDICTION OF SEDIMENT YIELDS IN WISCONSIN STREAMS,
Geological Survey, Madison, Wis.
S. M. Hindall.

Available from the National Technical Information Service, Springfield, Va 22161, as ADA-022 059, $4.00 printed copy; $2.25 microfiche. Water-Resources Investigations 54-75, January 1976. 27 p, 6 fig, 4 tab, 22 ref.

Descriptors: *Sediment transport, *Sediment yield, *Wisconsin, *Streams, Suspended load, Gaging stations, Data collections, Particle size, Bed load, Equations, Streamflow forecasting, Methodology.
Identifiers: *Ungaged sites, *Sediment yield forecasting.

Sediment data have been collected by the U.S. Geological Survey at 118 streamgaging sites throughout Wisconsin beginning in 1935. Enough data were collected at 84 of these sites to calculate average annual suspended-sediment transport. Measured average annual yields range from about 680 tons per square mile (238 tonnes per square kilometre) in the 'Driftless Area' to 3.1 tons per square mile (1.1 tonnes per square kilometre) in the Northern Highland province. The average suspended-sediment yield for Wisconsin is about 80 tons per square mile per year (38 tonnes per square kilometre per year). Sediment-yield prediction equations for four geographic provinces make it possible to predict average annual sediment yield at any point on 95 percent of the streams in the State. The prediction technique involves regression equations that relate average annual suspended-sediment yields to the controlling physical factors. The standard error of estimate for these four equations, which only represent the accuracy of an estimated sediment yield at an ungaged site, ranges from 28 to 38 percent. (Woodard-USGS)
W76-07600

A BOTTOM SEDIMENT TRAP FOR RECENT SEDIMENTARY DEPOSITS,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
L. Hakanson.
Limnology and Oceanography, Vol. 21, No. 1, p 170-174, January 1976. 5 fig, 12 ref.

Descriptors: *Sedimentation, *Sedimentation rates, *Lakes, Deposition(Sediments), Sediment distribution, Sediment load, Settling velocity, Sedimentology, Sediments, Sampling, Equipment, Limnology.
Identifiers: *Sediment traps, Sediment samplers.

A bottom trap for collection of recent sedimentary deposits has been constructed and field tested. The technique provides material, deposited within a known time span, unaffected by bioturbation in the upper biologically active sediment layer. The trap has an area of 1541 sq cm and an edge height of 5 cm. Before retrieval, a lid is lowered onto the trap. The apparatus is easy to handle and has yielded representative values for the rate of deposition. (Sims-ISWS)
W76-07766

SOURCE, TRANSPORTATION AND DEPOSITION OF DEBRIS ON ARAPAHO GLACIER, FRONT RANGE, COLORADO, U.S.A.,
Colorado Univ., Boulder. Dept. of Geological Sciences; and Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W76-07777

SEASONAL REVERSAL OF FLOOD-TIDE DOMINANT SEDIMENT TRANSPORT IN A SMALL OREGON ESTUARY,
Oregon Univ., Eugene. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W76-07783

COASTAL EROSION HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Rutgers - The State Univ., New Brunswick, N. J.
For primary bibliographic entry see Field 2L.
W76-07788

ERODIBILITY OF TAHOE SOILS,
M. Singer.
In: Proceedings: Lake Tahoe Research Seminar II, 27 September 1974, Sands Vagabond Convention Center, South Lake Tahoe, California. Report No. NSF/RA/G-74-012, p 79-88.

Descriptors: *Erosion, *Sedimentation, *Accelerated erosion, Forests, Mountains, Soil erosion, Erosion rates, Sediment yield, Slopes, Precipitation(Atmospheric), Simulated rainfall.
Identifiers: *Lake Tahoe(Nev-Calif).

The erosion program at Tahoe has three major focuses: (1) to measure actual amounts of erosion occurring on different kinds of soil, (2) to determine actual erodibility of soils, and (3) to trace the sources of sediments found in streams. Plots were established at seven sites on seven different soil series. The plots were 50 feet long and 6 feet wide, surrounded on three sides by redwood borders which were buried in the soil and extend a bit above the soil surface so that just erosion and just sediment movement within those borders could be measured. At the bottom end of the plots a pit was dug and lined with a cloth so that the sediment could be caught and weighed after different storm events. Rainfall on each of the sites was measured. The data from the plots were used to develop mathematical models to predict erosion. The basic chemical and physical properties of the different kinds of soils found in the Tahoe Basin were used to trace sediments from their source to the lake. (See also W76-07793) (Sims - ISWS)
W76-07799

WATER RESOURCES DATA FOR COLORADO, 1974: PART 2. WATER QUALITY RECORDS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-08047

2K. Chemical Processes

TRACE ELEMENTS IN SURFACE WATERS OF THE KARAGANDA OBLAST, (IN RUSSIAN),
E. A. Solodnikova.
Izv Akad Nauk Kaz SSR Ser Biol. 1, p 48-51, 1974.

Descriptors: *Trace elements, Surface waters, Copper, Zinc, Cobalt, Boron, Iodine, Manganese, Irrigation, Water sources, Molybdenum.
Identifiers: *USSR(Karaganda Oblast).

Surface waters (river, lakes, reservoirs) of the Karaganda Oblast, Kazakh SSR, USSR were investigated for their content of Cu, Zn, Mn, Co, Mo, B and I. The quantity of trace elements in them permitted the conclusion that the waters are completely suitable for drinking and irrigation. In the case of a deficiency of trace elements in soils and forage plants the water sources with such a content of these elements do not make up for their deficit in soils and forage. The content of trace elements in 39 water sources are given.--Copyright 1975, Biological Abstracts, Inc.
W76-07528

PITTSBURGH RAINWATER ANALYSIS BY PIXE,
Pittsburgh Univ., Pa.
For primary bibliographic entry see Field 5A.
W76-07555

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 1 - OHIO AND WABASH RIVER BASINS,
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07570

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 2 - ILLINOIS, FOX, SANGAMON, AND KANKAKEE BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07571

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 3 - DES PLAINES RIVER BASIN.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07572

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 4 - MISSISSIPPI RIVER (SOUTH, SOUTH CENTRAL, CENTRAL, NORTH CENTRAL, NORTH), BIG MUDDY RIVER, KASKASKIA RIVER, AND ROCK RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07573

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 1 - OHIO AND WABASH RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07575

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 2 - ILLINOIS, FOX, SANGAMON, AND KANKAKEE BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07576

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA - VOLUME 3, DES PLAINES RIVER BASIN.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07577

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 4 - MISSISSIPPI RIVER (SOUTH, SOUTH CENTRAL, CENTRAL, NORTH CENTRAL, NORTH), BIG MUDDY RIVER, KASKASKIA RIVER, AND ROCK RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07578

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, 1975--A BASIC-DATA REPORT,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W76-07588

AVAILABILITY OF GROUND WATER IN THE PEMIGEWASSET AND WINNIPESAUKEE RIVER BASINS, CENTRAL NEW HAMPSHIRE,
Geological Survey, Concord, N. H.
For primary bibliographic entry see Field 7C.
W76-07589

REFERENCE GUIDE TO METHODOLOGY FOR THE ANALYSIS OF ORGANIC COMPOUNDS.
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 5A.
W76-07590

WATER RESOURCES OF PIERCE COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Conservation Co and Div.
For primary bibliographic entry see Field 4A.
W76-07598

WATER-RESOURCES RECONNAISSANCE OF ST. GEORGE ISLAND, PRIBILOF ISLANDS, ALASKA.
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W76-07601

CHEMICAL CHARACTERISTICS OF THE LOWER KISSIMMEE RIVER, FLORIDA--WITH EMPHASIS ON NITROGEN AND PHOSPHORUS,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5A.
W76-07603

DETECTION OF TRACE PHOSPHORUS IN NATURAL WATERS BY GRAPHITE OVEN FLAME ANALYSIS,
Georgia Univ., Athens. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-07672

AN INVESTIGATION OF THE OCCURRENCE OF OCEANIC TURBULENCE WITH RESPECT TO FINESTRUCTURE,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 2L.
W76-07773

THE SPECIFIC HEAT OF SALINE ICE,
McGill Univ., Montreal (Quebec). Ice Research Project.
For primary bibliographic entry see Field 2C.
W76-07776

HEAVY METALS AS TRACE CONSTITUENTS IN NATURAL GROUNDWATERS AND POLLUTED,
Kiel Univ. (West Germany). Geologish-Palaeontologisches Institut und Museum.
For primary bibliographic entry see Field 5A.
W76-07978

APPLICATION OF THE STAINTON SYRINGE METHOD TO THE ANALYSIS OF MERCURY IN NATURAL WATERS,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5A.
W76-08025

A NEW CONVENIENT METHOD FOR DETERMINING ARSENIC(+3) IN NATURAL WATERS,
Rutgers The State Univ., New Brunswick, N. J. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5A.
W76-08027

GEOLOGY AND GROUND-WATER RESOURCES OF HETTINGER AND STARK COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 4B.
W76-08043

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 9 AND 10. COLORADO RIVER BASIN AND THE GREAT BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-08045

WATER RESOURCES DATA FOR COLORADO, 1974: PART 2. WATER QUALITY RECORDS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-08047

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--TEXAS-GULF REGION,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2F.
W76-08051

SURFACE-WATER RESOURCES OF THE TANGIPAHOA, TCHEFUNCTA, AND NATALBANY RIVER BASINS, SOUTHEASTERN LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 4A.
W76-08056

SOLUTE TRANSPORT AND MODELING OF WATER QUALITY IN A SMALL STREAM,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-08058

MIX2: A COMPUTER PROGRAM FOR MODELING CHEMICAL REACTIONS IN NATURAL WATERS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-08062

2L. Estuaries

PROCEEDINGS: SECOND WETLANDS CONFERENCE (HELD ON JANUARY 9, 1974 AT STORRS, CONNECTICUT),
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6E.
W76-07451

GRAYS HARBOR ESTUARY, WASHINGTON; REPORT 5, MAINTENANCE STUDIES OF 35-FT-DEEP (MSL) NAVIGATION CHANNEL; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07454

TYPE 16 FLOOD INSURANCE STUDY: TSUNAMI PREDICTIONS FOR MONTEREY AND SAN FRANCISCO BAYS AND PUGET SOUND,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 6F.
W76-07456

SHORE EFFECT MODEL, ATLANTIC GENERATING STATION; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07457

RIVER POINT DIRECTORY FOR THE MISSISSIPPI RIVER-GULF COAST INLAND WATERWAYS SYSTEM,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. L. Daggett, and R. W. McCarley.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-A011 267, $7.75 in paper copy, $2.25 in microfiche. Miscellaneous Paper H-75-6, May 1975. 223 p, 1 tab, 4 append, 7 ref.

Descriptors: *Gulf coastal plain, *Inland waterways, *Channels, Documentation, Publications.
Identifiers: *Gulf intercoastal waterway, *Navigation directories, *River point directory, Waterborne commerce.

The River Point Directory is a quick-reference working document for use by engineers and planners in the general fields of river navigation and waterborne commodity movements. All navigable rivers, bayous, streams, and other such waterways in the Mississippi River-Gulf Coast region are included. The rivers are, in general, listed in the order of their importance as commodity transportation arteries with regard to varying degrees of impact on the economic welfare of the United States. The Directory is, in essence, a compilation of significant data relating to each commercial dock, town, landing, navigation lock, bridge, junction, and other such river points contained in selected portions of the U. S. Army Engineer Waterborne Commerce Statistical Center (WSCS) Port and Dock Code Manual (Parts 2 and 3), dated 1 January 1973. (WES)
W76-07458

CHESAPEAKE BAY RADIOACTIVE TRACER STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5B.
W76-07460

WESTPORT SMALL-BOAT BASIN REVISION STUDY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07462

PHYSICAL HYDRAULIC MODELS: ASSESSMENT OF PREDICTIVE CAPABILITIES; REPORT 1, HYRODYNAMICS OF THE DELAWARE RIVER ESTUARY MODEL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07463

EFFECT OF SOURCE ORIENTATION AND LOCATION IN THE ALEUTIAN TRENCH ON TSUNAMI AMPLITUDE ALONG THE PACIFIC COAST OF THE CONTINENTAL UNITED STATES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07464

MASONBORO INLET, NORTH CAROLINA, MOVABLE-BED HYDRAULIC MODEL STUDY, EFFECTS OF TEMPERATURE AND EXPERIMENTAL PROCEDURES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07466

MOBILE BAY MODEL STUDY: EFFECTS OF PROPOSED THEODORE SHIP CHANNEL AND DISPOSAL AREAS ON TIDES, CURRENTS, SALINITIES, AND DYE DISPERSION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07467

EXPANSION OF PORT HUENEME, CALIFORNIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07468

LOS ANGELES AND LONG BEACH HARBORS MODEL STUDY; REPORT 5, TIDAL VERIFICATION AND BASE CIRCULATION TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07474

DESIGN OF JUBAIL HARBOR, SAUDI ARABIA, ROYAL SAUDI NAVAL EXPANSION PROGRAM; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07475

DESIGN OF AGANA SMALL-BOAT HARBOR, TERRITORY OF GUAM; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07478

ABUNDANCE, DIVERSITY AND SEASONALITY OF FISHES IN COLORADO LAGOON, ALAMITOS BAY, CALIFORNIA,
California State Univ., Fullerton. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-07482

A STUDY OF THE FAUNA IN DREDGED CANALS OF COASTAL LOUISIANA,
Louisiana Wildlife and Fisheries Commission, New Orleans.
For primary bibliographic entry see Field 5C.
W76-07486

FORM, GENESIS, AND DEFORMATION OF CENTRAL CALIFORNIA WAVE-CUT PLATFORMS,
Colorado Univ., Boulder. Dept. of Geological Sciences.
W. C. Bradley, and G. B. Griggs.
Geological Society of America Bulletin, Vol. 87, No. 3, p 433-449, March 1976. 16 fig, 5 tab, 123 ref. NSF G19774.

Descriptors: *Geomorphology, *Shoreline cover, *California, Shores, Sea level, Deformation, Folds(Geologic), Bedrock, Sediment transport, Erosion, Waves(Water), Currents(Water), Quaternary period.
Identifiers: *Shore features, *Ben Lomond Mountain(Calif), Marine terraces, Sea level changes,

Uplift rates, Platforms, Platform ages, Terrace deposits, Nearshore process, Wave drift.

Modern and ancient wave-cut platforms on Ben Lomond Mountain in central California are broadly similar in shape. They have a seaward slope composed of two segments: a steeper, slightly concave inshore segment, with gradients of generally 0.02 to 0.04, and a flatter, planar offshore segment with gradients of 0.007 to 0.017. The flattest inshore and offshore gradients measured were, respectively, 0.015 and 0.005, suggesting that these are close to minimum gradients for erosional platforms in central California. The inshore segments are generally 300 to 600 m wide and extend to a depth of 8 to 13 m. Platforms are widest in areas where soft sandstone crops out and where there has been least uplift. Major storm waves now break in water 7 to 12 m deep. It was concluded that inshore platform segments were associated with storm-wave surf zones and that offshore segments were associated with the zone of deep-water wave transformation. Ben Lomond platforms have been uplifted and progressively tilted in a seaward direction, indicating that late Tertiary domical uplift has continued into Quaternary time. Uplift rates have ranged from 0.16 m/1000 yr near Santa Cruz to 0.26 m/1000 yr near Greyhound Rock. (Lee - ISWS)
W76-07552

SOME OBSERVATIONS OF THE DEEP FLOW IN THE BORNHOLM STRAIT DURING THE PERIOD JUNE 1973-DECEMBER 1974,
Goteborg Univ. (Sweden). Oceanographic Inst.
O. Petren, and G. Walin.
Tellus, Vol. 28, No. 1, p 74-87, 1976. 15 fig, 1 tab, 4 ref.

Descriptors: *Salinity, *Flow, *Straits, On-site investigations, On-site data collections, Measurement, Saline water, Channels, Surface waters, Hydrography, Oceanography.
Identifiers: *Bornholm Strait, *Baltic Sea, *Sweden.

Preliminary observations of the deep water flow penetrating into the Baltic were presented. An important feature of the measurements is that the distribution of the flux with respect to salinity were resolved. The mean salt and volume fluxes obtained from the observations were checked against the fresh water supply with surprisingly good result. (Sims - ISWS)
W76-07557

ANCHOR-LAST DEPLOYMENT SIMULATION BY LUMPED MASSES,
Oregon State Univ., Corvallis. Dept. of Mechanical and Nuclear Engneering.
R. W. Thresher, and J. H. Nath.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 101, No. WW4, Proceedings Paper 11709, p 419-433, November 1975. 14 fig, 2 tab, 9 ref, 3 append. ONR N00014-67-A-0369-007.

Descriptors: *Anchors, *Buoys, *Research equipment, Model studies, Mathematical models, Numerical analysis, Simulation analysis, Loads(Forces), Peak loads, Stress, Velocity, Mechanical properties, Equipment, Analytical techniques, Mechanical engineering, Oceanography.
Identifiers: Lumped-mass solutions, Dynamic response, Cables, Moorings.

Often the anchor is deployed as the final action in the mooring of buoys in the water. It has not been economical to calculate the transient conditions in the mooring line until a predictor-corrector technique was developed, which calculates the positions of the anchor and mooring line, the accompanying velocities, and the tensions throughout the line, all as a function of time. This study was based on a numerical lumped mass model representation of a single continuous nylon line 5000 ft long. The results obtained showed no line snap loads for the configurations considered. It appears that the high drag of the long mooring line quickly dissipates the kinetic energy of the anchor and reduces the anchor velocity to about 10 fps-15 fps. The buoy horizontal velocity of 10 fps would tend to indicate the potential for large dynamic loads from wave motion. (Sims - ISWS)
W76-07559

A WIND-DRIVEN NEAR-BOTTOM CURRENT IN THE SOURTHERN NORTH SEA,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre.
V. N. D. Caston.
Estuarine and Coastal Marine Science, Vol. 4, No. 1, p 23-32, January 1976. 5 fig, 22 ref.

Descriptors: *Currents(Water), *Ocean currents, *Winds, Sediment transport, Tides, Offshore platforms, Oil wells, On-site investigations, Wind tides, Wind velocity, Oceanography.
Identifiers: *North Sea.

Simultaneous recordings of wind and near-bottom current velocity and direction were made over the period November 8-December 16, 1967 from two production platforms situated in the southwestern North Sea. The current measurements were made 4.6 m above sea bed in a total water depth of 34.7 m LAT. Throughout the greater part of the period the recorded current velocities agreed closely with predicted values calculated on the basis of a correlation with tidal range data. Over a 125-hr period, however, the south-going currents were very much stronger and the north-going streams considerably less than anticipated. This corresponded with a period of high wind speeds which touched 25.7 m/s (50 kts) and exceeded 18 m/s (35 kts) for 68 hr and which blew sub-parallel to the direction of flow of the southerly-flowing current. The increase in velocity of the near-bottom southerly-going current averaged 23 cm/s, exceptionally 36 cm/s, and was equivalent to a figure of between 1.4 and 2% of the wind speed. It was suggested that these anomalously high values may be related to a shift in the axes of current streams flowing between sand banks adjacent to the platform from which the current measurements were made. (Sims-ISWS)
W76-07562

NUMERICAL CALCULATION OF THE WAVE INTEGRALS IN THE LINEARIZED THEORY OF WATER WAVES,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W76-07565

ESTABLISHMENT OF VEGETATION FOR SHORELINE STABILIZATION IN GALVESTON BAY,
Texas A and M Univ., College Park, Dept. of Range Science.
J. D. Dodd, and J. W. Webb.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-A012 839, $4.50 in paper copy, $2.25 in microfiche. Coastal Engineering Research Center Miscellaneous Paper No. 6-75, April 1975. 67 p, 13 fig, 27 tab, 20 ref. CERC DACW72-74-C-0002

Descriptors: *Shore protection, *Vegetation, *Erosion, *Texas, Vegetation establishment, Marsh plants, Coastal marshes, Shoreline cover, Salinity, Salt tolerance, Saline soils, Bays, Estuaries.
Identifiers: *Galveston Bay(Tex), *Upper Texas Coast, Wave stilling.

The objective of this study was to determine which resident species of plants adapted to saline conditions can be used to control shore erosion in bays or estuaries. Water salinity and soil physical and chemical characteristics were determined at the experimental planting sites at East Bay near Galveston, Texas. The soil was loam or clay-loam texture and was structurally unstable and subject to wave erosion. Soil salinity varied from 2500 to more than 12,000 parts per million and water salinity from below 2500 to 18,000 parts per million. Twelve plant species were selected for evaluation of their ability to stabilize the shoreline. Giant reed (Arundo donax) is effective in the upper zone (above MHW). Black mangrove (Avicennia germinans) can establish in the middle zone (MLW to MHW) and lower zone (below MLW). Saltgrass (Distichlis spicata) may be used in the middle zone if wave action is low at planting time. Gulf cordgrass (Spartina spartinae) is adapted for use in the upper zone and smooth cordgrass (Spartina alterniflora) is well adapted for use in the middle and lower zones. Several combinations of species were suggested for different zones. An inexpensive wave-stilling device to protect planting from wave action was described. (Sims-ISWS)
W76-07567

HYDROLOGIC CHARACTERISTICS OF LAGOONS AT SAN JUAN, PUERTO RICO, DURING A JANUARY 1974 TIDAL CYCLE,
Geological Survey, Fort Buchanan, Puerto Rico.
For primary bibliographic entry see Field 5B.
W76-07597

WATER-RESOURCES RECONNAISSANCE OF ST. GEORGE ISLAND, PRIBILOF ISLANDS, ALASKA.
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W76-07601

TAXONOMIC DIFFICULTIES IN RED TIDE AND PARALYTIC SHELLFISH POISON STUDIES: THE 'TAMARENSIS COMPLEX' OF CONYAULAX,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-07614

THE 1971 RED TIDE AND ITS IMPACT ON CERTAIN REEF COMMUNITIES IN THE MID-EASTERN GULF OF MEXICO,
Florida Dept. of Natural Resources, St. Petersburg, Marine Research Lab.
For primary bibliographic entry see Field 5C.
W76-07615

LAND DRAINAGE AS A FACTOR IN 'RED TIDE' DEVELOPMENT,
Department of the Environment, Ottawa (Ontario). Shellfish Water Quality Div.
For primary bibliographic entry see Field 5C.
W76-07616

SOME OF THE GROWTH CHARACTERISTICS OF GONYAULAX TAMARENSIS ISOLATED FROM THE GULF OF MAINE,
Salem State College, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-07617

REPORT ON A BIOCHEMICAL RED TIDE REPRESSIVE AGENT,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W76-07618

IMPLICATIONS OF DINOFLAGELLATE LIFE CYCLES ON INITIATION OF GYMNODINIUM BREVE RED TIDES,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W76-07619

AN ANALYTICAL STUDY OF THE ROLE OF VARIOUS FACTORS CAUSING RED TIDE OUTBREAKS OF TRICHODISMIUM AS DEDUCED FROM FIELD AND LABORATORY OBSERVATION,
For primary bibliographic entry see Field 5C.
W76-07620

OCCURRENCE OF FORAMINIFERA, MOLLUSCS AND OSTRACODS ADJACENT TO THE INDUSTRIALIZED SHORELINE OF CANSO STRAIT, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5C.
W76-07621

WATER RESOURCES ISSUES AND THE 1972 UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-07688

AN ENZOOTIC NUCLEAR POLYHEDROSIS VIRUS OF PINK SHRIMP: ULTRASTRUCTURE, PREVALENCE, AND ENHANCEMENT,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-07695

AN INVESTIGATION OF THE OCCURRENCE OF OCEANIC TURBULENCE WITH RESPECT TO FINESTRUCTURE,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
A. E. Gargett.
Journal of Physical Oceanography, Vol. 6, No. 2, p 139-156, March 1976. 9 fig, 2 tab, 24 ref.

Descriptors: *Oceans, *Turbulence, *Temperature, *Salinity, *Pacific Ocean, *Mixing, Density, Surveys, Measurement, Instrumentation, Circulation, Ocean circulation, On-site data collections, Oceanography, Profiles, Stratification.
Identifiers: *Finestructure.

Data obtained from the cycling mode of a towed system operated in the North Pacific were used to investigate the relationship of small-scale mixing to the finestructure which seems to be such a common characteristic of vertical profiles of oceanic water properties. The signal from a high-frequency response platinum-film thermometer was used, with the local mean vertical temperature gradient, to produce variables proportional to heat flux and eddy diffusivity for heat. Along with measured values for the local vertical salinity and density gradients, this information was used to examine some questions of interest in the general understanding of turbulence and finestructure. It was shown that in regions where the vertical density structure is distinctly layered, there is no noticeable tendency for mixing to occur preferentially on 'sheets,' the high-density-gradient regions which separate 'layers' of lower density gradient. Mixing events seem to occur at random with respect to the density field, suggesting that such events do not arise predominantly as small-scale Kelvin-Helmholtz instabilities on pre-existing finestructure. Instead, the evidence points to a much closer connection between turbulent mixing and the processes which act to produce and destroy finestructure. Between 60 and 70% of the turbulence encountered in the tows was associated with 'active' regions, areas where the vertical profiles of temperature and/or salinity show finestructure inversions. The density profile in such regions is often 'steppy' but invariably statically stable on vertical scales greater than about a meter, so that some basically horizontal process, such as inertial waves or density-driven interleaving, is required to produce the inversions in temperature and salinity. (Sims - ISWS)
W76-07773

A THREE-DIMENSIONAL SIMULATION OF COASTAL UPWELLING OFF OREGON,
Florida State Univ., Tallahassee Dept. of Oceanography.
M. B. Peffley, and J. J. O'Brien.
Journal of Physical Oceanography, Vol. 6, No. 2, p 164-180, March 1976. 13 fig, 1 tab, 31 ref, 1 append. NSF GX-33502.

Descriptors: *Upwelling, *Coasts, *Oregon, *Pacific Ocean, *Model studies, Mathematical models, Topography, Ocean circulation, Oceans, Oceanography, *Simulation analysis.
Identifiers: *Cape Blanco(Ore).

The wind driven, x-y-t, two-layer beta-plane numerical model developed by Hurlburt was used to investigate the effects of a bottom topography and coastline configuration, like that off Oregon, on the onset and decay of the ocean upwelling circulation. The digitized nearshore Oregon bathymetry was analyzed for dominant scales, and a smoothed version was used in model cases with several different initial states and wind stresses. Cases with topography were compared to cases with plane sea beds. Topographic variations were found to dominate over coastline irregularities in determining the longshore distribution of upwelling. Results indicated that stronger upwelling observed near Cape Blanco is primarily due to the local bottom topography and not the cape itself. Observed variations in the meridional and zonal flow were attributed to the topographic beta-effect. In particular, during spin-up with an equator-ward wind stress, a nearshore poleward undercurrent is most likely to develop in regions where topographic beta is positive. Upper layer poleward flow was observed during spin-down. The existence of an onshore transport jet south of Cape Blanco was predicted. Zonal mass balance was not observed. Topographic Rossby waves were excited during spin-up. Baroclinic continental shelf waves were observed in time series of the pycnocline height contours. (Sims-ISWS)
W76-07775

THE SPECIFIC HEAT OF SALINE ICE,
McGill Univ., Montreal (Quebec). Ice Research Project.
For primary bibliographic entry see Field 2C.
W76-07776

A BOUNDARY FRONT IN THE SUMMER REGIME OF THE CELTIC SEA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
J. H. Simpson.
Estuarine and Coastal Marine Sciences, Vol. 4, No. 1, p 71-81, January 1976. 6 fig, 9 ref.

Descriptors: *Temperature, *Salinity, *Saline water-freshwater interfaces, *Ocean circulation, Buoys, Floats, Measurement, On-site investigations, On-site data collections, Water circulation, Density, Density currents, Oceans, Estuaries, Oceanography.
Identifiers: *Celtic Sea.

Sections through a region of low tidal stream energy in the Celtic Sea in August show a high degree of stratification, which breaks down abruptly at the entrance to the Irish Sea and the Bristol Channel. Radio tracked parachute drogues have been used to observe the flow both along the front and at the center of the low energy region. A temperature-salinity-density section of the front, combined with the drogue observations, indicated that the front contains a strongly baroclinic zone implying velocity components parallel to the front of up to 30 cm/s. The residual velocities observed in the low energy region were found to be in approximate geostrophic balance with the density field and in a westerly direction, with a maximum amplitude of about 9 cm/s. (Sims - ISWS)
W76-07782

SEASONAL REVERSAL OF FLOOD-TIDE DOMINANT SEDIMENT TRANSPORT IN A SMALL OREGON ESTUARY,
Oregon Univ., Eugene. Dept. of Geology.
S. Boggs, Jr., and C. A. Jones.
Geological Society of America Bulletin, Vol. 87, No. 3, p 419-426, March 1976. 13 fig, 3 tab, 24 ref.

Descriptors: *Sedimentation, *Sediment transport, *Oregon, Fluorescent dye, Estuaries, Tides, Tidal streams, Hydrology, Currents(Water), Dye releases, Discharge(Water), Sedimentary structures.
Identifiers: *Bed forms, *Sixes River(Ore), Heavy minerals, Tidal currents, Coastal streams.

The Sixes River in southwestern Oregon has a summer discharge of only about 2 cu m/sec. During these low-discharge conditions, a flood-dominated system of bottom tidal currents develops in the estuary and a deltalike sill, as much as 1.5 m in height, builds across the mouth of the estuary by upstream progradation. Flood-tide currents move across this sill at velocities of as much as 90 cm/sec 15 cm above the bottom, but the velocity of ebb-tide currents usually does not exceed about 40 cm/sec. Dispersal patterns of dyed sediment injected at the river mouth during low river discharge showed that flood-tide currents transport sand across the sill and up the estuary as far as 0.8 km (about one-fourth the length of the estuary) in a single flood-tide phase. During ebb tide, the sill impedes movement of salt water along the estuary bottom, producing a sharply stratified two-layer water system. River discharge after winter storms may increase to more than 400 cu m/sec, and large quantities of detritus, including gravel, are transported downstream into and through the estuary. High river discharge also causes erosion of the sill, greatly reducing the sediment-trapping capacity of the estuary. The finer fluvial detritus, together with fine marine sediment deposited during the summer, is swept from the estuary, leaving it floored largely by gravel. (Lee - ISWS)
W76-07783

COASTAL EROSION HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Rutgers - The State Univ., New Brunswick, N. J.
J. H. Sorensen, and J. K. Mitchell.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-2442 974, $5.00 paper copy, $2.25 in microfiche. Colorado University Institute of Behavioral Science Monograph NSF-RA-E-75-014, 1975. 65 p, 4 fig, 10 tab, 91 ref. NSF GI-32942.

Descriptors: *Coasts, *Erosion, *Hazards, *Research priorities, Coastal structures, Shore protection, Land use, Warning systems, Forecasting, Rehabilitation, Beach erosion, Coastal engineering, Ocean waves, Storms.

Research on coastal erosion has traditionally been centered on control and protection works designed to eliminate erosion causes or to reduce direct damages. Since 1970, Federal initiatives have prompted the development of new adjustment options which hold the promise of diversifying attempts to cope with the hazard. This has set the

stage for research which would enable the nation to make more effective use of new developments in coastal erosion management. Approximately one quarter of the national shorefront is significantly affected by erosion. Critical erosion occurs along 2700 miles of coastline, chiefly on the heavily populated Atlantic and Great Lake coasts. Problems are caused when erosional processes and human activities conflict. Average shoreline recessions of less than one foot per year on densely settled coasts may produce heavy damages, while elsewhere, in sparsely populated coastal areas, annual recessions of more than 20 feet may pose no significant hazard. Both erosion and accumulation are influenced by man-induced, as well as natural processes. Research on coastal erosion is indicated along four major lines: (1) control and protection works, (2) land use management, (3) warnings and forecasting, and (4) relief, rehabilitation, and insurance. The emphasis reflects shifts in management policies in the past few years which may allow significant reductions in erosion damages if the necessary technology and knowledge becomes available. (Sims - ISWS)
W76-07788

MODELS FOR IMPLEMENTING THE CZMA'S CONCEPT OF STATE-LOCAL RELATIONS,
Nassau-Suffolk Regional Planning Board, N. Y.
For primary bibliographic entry see Field 6E.
W76-07803

COASTAL BOUNDARY LITIGATION WITH THE STATE: A FRAME OF REFERENCE,
Florida State Dept. of Environmental Regulation, Tallahassee.
For primary bibliographic entry see Field 6E.
W76-07804

THE HAWAIIAN ARCHIPELAGO DEFINING THE BOUNDARIES OF THE STATE,
Hawaii Univ., Honolulu. School of Law.
For primary bibliographic entry see Field 6E.
W76-07818

PUBLIC RIGHTS IN GEORGIA'S TIDELANDS,
Georgia Univ., Athens. Inst. of Government.
For primary bibliographic entry see Field 6E.
W76-07824

GEOGRAPHY AND THE LOS DEBATE: GEOGRAPHICAL FACTORS AND THE PATTERNS OF ALIGNMENT,
Rhode Island Univ., Kingston. Law of the Sea Inst.
For primary bibliographic entry see Field 6E.
W76-07826

MAJOR ISSUES OF THE LAW OF THE SEA,
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 6E.
W76-07827

INTRODUCTION,
New Hampshire Univ., Durham. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W76-07828

CONCLUSION,
New Hampshire Univ., Durham. Law of the Sea Intern Program.
For primary bibliographic entry see Field 6E.
W76-07842

TWO -HUNDRED -MILE FISHING ZONE.
For primary bibliographic entry see Field 6E.
W76-07863

PRODUCTION OF SOME MASS CRUSTACEANS OF THE KUIBYSHEV RESERVOIR IN THE REGION OF SVIYAZH BAY, (IN RUSSIAN),
Kazan State Univ. (USSR). Dept. of Vertebrate Zoology.
For primary bibliographic entry see Field 5C.
W76-07935

OCEANOGRAPHIC STRUCTURE OF THE MUTU BAY, (IN JAPANESE),
Hokkaido Univ., Sapporo (Japan). Lab. of Oceanography and Meteorology.
K. Ohtani, and T. Terao.
Bull Fac Fish Hokkaido Univ 24(3), p 100-131, 1974.

Descriptors: *Bays, Asia, *Fisheries, Oceanography, Salinity, Seasonal, Stratification, Temperature.
Identifiers: *Japan(Mutu Bay), Scallop.

The Mutu Bay is a spacious, shallow bay in Japan. It is subdivided into a western bay near the mouth and an inner eastern bay. Many kinds of marine food are produced in the bay by fisheries. A large number of scallops are produced by recent development of an artificial cultural fishery. The water of the Tugaru Warm Current, having a high salinity of 34.0% or more, comes into Mutu Bay. During the cool season the vertical distribution of properties becomes almost homogeneous; the horizontal distribution of temperature decreases from the mouth of the bay through the W coast of the western bay toward the eastern bay. The water of the eastern bay, which is relatively colder and less saline than of the western bay, is almost homogeneous in temperature and alin vertically and horizontally. A horizontal discontinuity of properties is clearly formed between the 2 bays. At the beginning of the warm season the water in the surface layer of the Tusima Warm Current, which is the original current of the Tugaru Warm Current, is diluted by melting snow from the mountains in N Japan along the coast of the Japan Sea. The water in Mutu Bay is further diluted, especially in the eastern bay and the inner part of the western bay. The salinity of the surface layer falls to a minimum of 33.0% or less during the year and the vertical salinity gradient increases during this period. Heating from the surface increased the difference in density between the surface layer and lower layer; consequently a large pycnocline is formed between them producing a stratified structure in summer. Through the year, the salinity of the eastern bay is lower than that of the western bay and a horizontal discontinuity zone is continuously formed between them.
W76-07946

THE PRODUCTIVITY OF THE WATERS OF MAR GRANDE AND MAR PICCOLO OF TARANTO (1962-1969), (IN ITALIAN),
A. Vatova.
Boll Pesca Fiscic Idrobiol 27(1); p 81-103, 1972.

Descriptors: Productivity, Lakes, Gulf, Saline water, Climates, Mussels, Plankton, Water temperature.
Identifiers: *Italy, Mar-Grande, Mar-Piccolo, Springs, Taranto.

The Mar Grande of Taranto (Italy) communicates almost freely with the Gulf of the same name; the Mar Piccolo, divided by a bottleneck into 2 basins, is more like a salty coastal lake. From its bottom emerge numerous underwater springs, known as citri, which act as thermosaline regulators, to the advantage of the cultivation of mussels. For 8 yr, in 4 fixed stations, monthly hydrographic measurements were taken, combined with vertical catches of plankton and measurements of productivity with 14C. The environment is affected by the climatic conditions of the region with its heavy winter rains and prolonged summer droughts. The net annual productivity for the Mar Grande, with a surface area of 36.5 km2 and a volume of 0.541 km3, was calculated at 5.3 x 103 metric tons, and for the Mar Piccolo, with a surface area of 20.7 km2 and a volume of 0.152 km3, at 2.8 x 103 metric tons.
W76-07947

STUDY OF OCEANOGRAPHIC CONDITIONS IN THE AROSA ESTUARY IN WATER, (IN SPANISH),
J. G. Gallego.
Bol Inst Esp Oceanogr 185, p 1-53, 1975.

Descriptors: Estuaries, Oceanography, Salinity, Water temperature, Oxygen, Data collections, Winter, Dissolved oxygen.
Identifiers: *Spain(Arosa estuary).

Data were obtained from 25 stations distributed over the entire estuary from Jan. 20th-Feb. 26th 1969. The variations in temperature and salinity in relation to the space, depth, time and state of the tide were studied together with the intensity and direction of the currents, according to depth and tide. The stability of the water and, on a more superficial level, the dissolved O2 were also studied. The in situ meteorological conditions were constantly accounted for.--Copyright 1975, Biological Abstracts, Inc.
W76-07948

APPLICATIONS OF SHANNON'S INDEX TO THE STUDY OF INTERTIDAL VEGETATION, (IN FRENCH),
Instituto de Investigaciones Pesqueras, Vigo (Spain). Laboratorio de Investigaciones Pesqueras.
X. Niell.
Bull Soc Phycol Fr 19, p 238-254, 1974.

Descriptors: *Productivity, Vegetation, Succession, Maturity, Intertidal areas.
Identifiers: *Shannons Index.

The Shannon index has been used to study benthic community structure. Using this index to measure diversity, a minimum work area is determined. Different types of vegetation become evident when the limits of the spacial distribution are studied. These types are related to ecological accidents. Diversity values are used to know the community structure, its importance in succession and its maturity. Diversity indexes are related to productivity and biomass intuitively. Copyright 1975, Biological Abstracts, Inc.
W76-07949

MINIMAL AREA AND ALGAL MARINE SETTLEMENTS, (IN FRENCH),
Aix-Marseille-2 Univ. (France). Laboratoire de Biologie Vegetale.
C. F. Boudouresque.
Bull Soc Phycol Fr 19, p 141-157, 1974.

Descriptors: *Algae, Europe, Coasts, Data collections, *Marine algae.
Identifiers: *France.

Data were collected from 3 samples at 2 sites of the Pyrenees-Orientales (French Mediterranean coast). For each sample, a number of contiguous 4 cm2 quadrats were examined. Species presence in every quadrat was noted. Species-area graphs show a rapid initial rise followed by a decline in the rate of increase. These graphs justify the selection of 500 cm2 areas as the minimal area. Similarity indices-area graphs justify a smaller and less empirical minimal area (200 cm2).--Copyright 1975, Biological Abstracts, Inc.
W76-07951

PRELIMINARY NOTE ON THE ALGAL POPULATION OF THE SCIOPHILOUS SURFACE BIOTOPES IN THE EXPOSED MODE, OF THE

ISLAND OF LINOSA (STRAIT OF SICILY, ITALY), (IN FRENCH),
Naples Zoological Station (Italy).
F. Cinelli, G. Furnari, G. Giaccone, B. Scammacca, and A. Solazzi.
Bull. Soc Phycol Fr 19, p 95-100, 1974.

Descriptors: Algae, Marine algae, Vegetation, Europe, Aquatic habitats.

For the 1st time the algal vegetation, of Linosa, an islet between Malta and Tunisia, was studied in toto (with physico-chemical records). The sciaphilic population of algae in an exposed habitat was studied with the help of a sociological and statistical method.--Copyright 1975, Biological Abstracts, Inc.
W76-07952

THE PRIMARY PRODUCTIVITY OF MARINE MACROPHYTES FROM A ROCKY INTERIDAL COMMUNITY,
California Univ., Irvine. Dept. of Population and Environmental Biology.
For primary bibliographic entry see Field 5C.
W76-07965

AMERICAN LOBSTERS AT ARTIFICIAL REEFS IN NEW YORK,
New York Dept. of Environmental Conservation, Delmar. Wildlife Research Lab.
P. T. Briggs, and C. S. Zawacki.
N Y Fish Game J. 21(1), p 73-77, 1974.

Descriptors: *Lobsters, Atlantic Ocean, Bays, Population, *Reefs, *New York.
Identifiers: *Artificial reefs, Great South Bay(NY).

The American lobster (H. americanus) was studied at 2 artificial reefs, one in Great South Bay (New York) and the other in the Atlantic Ocean. Different catch rates, sizes and sex ratios were observed at these reefs. The differences in population parameters appeared to be primarily a result of onshore migration of adult lobsters from offshore stocks to the oceanic reef. Higher catch rates at the oceanic reef were attributed to both longer fishing time for the gear there and the onshore migration of lobsters from offshore stocks.--Copyright 1974, Biological Abstracts, Inc.
W76-07967

PHYTOPLANKTON OF THE TAMPA BAY SYSTEM, FLORIDA,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-07973

MEASUREMENTS OF PHYTOL IN ESTUARINE SUSPENDED ORGANIC MATTER,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 5A.
W76-07974

THE GRADIENT OF SALINITY, ITS SEASONAL MOVEMENT, AND ECOLOGICAL IMPLICATIONS FOR THE LAKE IZABAL-RIO DULCE ECOSYSTEM, GUATEMALA,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-07975

EFFECT OF A SUBLETHAL CONCENTRATION OF PHENOL ON SOME BLOOD PLASMA ENZYME ACTIVITIES IN THE PIKE (ESOX LUCIUS L.) IN BRACKISH WATER,
Helsinki Univ. (Finland). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-07977

MERCURY IN SOME MARINE ORGANISMS FROM THE OSLOFJORD,
Oslo Univ. (Norway). Dept. of Marine Zoology.
For primary bibliographic entry see Field 5C.
W76-07982

STUDIES OF PARAGONIMUS OHIRAI MIYAZAKI: 1939 AND P. SADOENSIS MIYAZAKI ET AL. 1968 FOUND IN NOTO PENINSULA, ISHIKAWA PREFECTURE: JAPAN, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Lab. of Medical Zoology; and Kyushu Univ., Fukuoka (Japan). School of Health Science.
For primary bibliographic entry see Field 5C.
W76-07991

PRELIMINARY NOTE ON THE OBSERVATION OF TERRIGENOUS DRIFTS INTO THE SEA, OBTAINED BY MEANS OF TELEVISED PICTURES TRANSMITTED BY ARTIFICIAL SATELLITES, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5B.
W76-07992

THE GULF AND THE ESTUARY OF THE SAINT-LAWRENCE RIVER: REVIEW OF THE PRINCIPAL PAPERS ON CHEMICAL OCEANOGRAPHY, (IN FRENCH),
Quebec Univ., Rimouski (Quebec). Dept. of Pure Sciences.
For primary bibliographic entry see Field 5B.
W76-07993

NEKTON POPULATION DYNAMICS IN THE ALBEMARLE SOUND AND NEUSE RIVER ESTUARIES,
North Carolina Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-08037

A STUDY OF THE MARINE RESOURCES OF HINGHAM BAY,
For primary bibliographic entry see Field 5C.
W76-08039

A SURVEY OF ENVIRONMENTAL FEATURES IN A SECTION OF THE VELLAR-COLERON ESTUARINE SYSTEM, SOUTH INDIA,
Centre of Advanced Study in Marine Biology, Porto Novo (India).
For primary bibliographic entry see Field 5C.
W76-08040

EXTENSION OF THE TORSHAVN BREAKWATERS,
E. Pihl & Son AS, Copenhagen, Denmark.
For primary bibliographic entry see Field 8A.
W76-08071

AN EXPLORATORY SURVEY AND ANALYSIS OF SAILING IN GALVESTON BAY, TEXAS,
Texas A and M Univ., College Station. Coll. of Agriculture.
For primary bibliographic entry see Field 6B.
W76-08095

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

MERCURY RECOVERY,
For primary bibliographic entry see Field 5D.
W76-07627

APPLICATION OF SYSTEM ANALYSIS IN TWO-STAGE REVERSE OSMOSIS PROCESS DESIGN FOR WATER DESALINATION,
National Research Council of Canada, Ottawa, Division of Chemistry.
H. Ohya, S. Kasahara, and S. Sourirajan.
Desalination, Vol. 16, No. 3, p 375-393, June 1975. 9 fig, 1 tab, 8 ref.

Descriptors: *Reverse osmosis, *Desalination, *Systems analysis, *Water treatment, *Water quality, Design, Water supply, Operations, Pressure, Flow rates, Computers, *Waste water treatment.

The concepts of system specification and systems analysis concerning reverse osmosis transport have been extensively developed and discussed in the literature; the application of these concepts to single-stage reverse osmosis process design for water desalination has been reported. This paper illustrates a similar application of the above concepts for a two-stage desalination process. The basic equations used have already been derived and are readily available in the literature. The problem is concerned with reverse osmosis desalination of an aqueous sodium chloride solution using Loeb-Sourirajan type cellulose acetate membranes to yield potable water. Further, the problem is to calculate the minimum power requirements for producing 1000 gallons of potable water, and the total membrane area requirements for a million gallons of potable water per day plant on the basis of specified operating requirements. The systems analysis approach illustrated herein offers a useful method for both two-stage and single-stage process design and optimization for reverse osmosis desalination. (Bell-Cornell)
W76-08076

3B. Water Yield Improvement

SURVEY OF IRRIGATION CANAL ECOLOGICAL PARAMETERS INFLUENCING AQUATIC WEED GROWTH,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 4A.
W76-07609

WEATHER MODIFICATION IN THE LAKE TAHOE BASIN,
H. E. Klieforth.
In: Proceedings: Lake Tahoe Research Seminar II, 27 September 1974, Sands Vagabond Convention Center, South Lake Tahoe, California. Report No. NSF/RA/G-74-012, p 69-77.

Descriptors: *Weather modification, *Cloud seeding, *California, *Nevada, Artificial precipitation, Precipitation(Atmospheric), Rain, Snow, Silver iodide, Meteorology.
Identifiers: *Lake Tahoe(Nev-Calif).

The history of weather modification by cloud seeding was reviewed. Some cloud seeding projects in the vicinity of Lake Tahoe were discussed. (See also W76-07793) (Sims - ISWS)
W76-07798

GEOHYDROLOGIC RECONNAISSANCE OF THE IMPERIAL VALLEY, CALIFORNIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-08052

3C. Use Of Water Of Impaired Quality

PERSPECTIVE ON USE OF FRESH WATER FOR COOLING SYSTEMS OF THERMOELECTRIC POWERPLANTS IN FLORIDA,
Geological Survey, Tallahassee, Fla.

For primary bibliographic entry see Field 3E.
W76-07596

PRELIMINARY OBSERVATION ON SEASONAL CHANGES IN THE SALT CONTENT OF AN IRRIGATED SOIL UNDER WHEAT-MAIZE ROTATION,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
Arjan Singh, and N. T. Singh.
J Indian Soc Soil Sci. 22(2), p 156-161, 1974.

Descriptors: *Seasonal, *Corn(Field), *Wheat, *Rotations, *Saline soils, Irrigation, Water table, Soil profiles, Soil moisture.

Seasonal changes in the salt content of an irrigated sandy soil under maize-wheat rotation were recorded. Water table depth in the area fluctuated and was within 150 cm from the surface during the monsoon season. Salt accumulation at and near the soil surface was at maximum during the hotter days of summer but returned to the previous level after the end of monsoon season. Salt balance of the profile did not change appreciably during the 2-yr period. Monsoon rains appear to be very effective in checking salt build-up in the surface soil.--Copyright 1975, Biological Abstracts, Inc.
W76-07954

THE PHYSICO-CHEMICAL CHANGES OF NEWLY FLOODED SOILS,
Andhra Pradesh Univ., Hyderabad (India). Agricultural Research Inst.
For primary bibliographic entry see Field 2G.
W76-07980

EFFECT OF WATER AND NUTRIENT REGIMES OF PEAT SOIL ON THE QUALITATIVE COMPOSITION OF STARCH IN POTATO TUBERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
I. A. Grigoryuk, N. N. Shevchenko, and S. I. Slukhai.
Fiziol Biokhim Kul'T Rast 7(2), p 145-151, 1975.

Descriptors: *Potatoes, Crop production, Fertilizers, Nutrients, *Phosphorus, Peat, *Copper.
Identifiers: *Starch, *Potato tubers.

The effect of potassic-P and Cu fertilizers and different levels of ground waters on the biochemical composition of starch in the tubers of the potato cultivar Sulev under conditions of the peat and soddy-low podzolic soils was studied. A decrease in the level of ground waters (up to 86 cm) and introduction of higher doses of K with a moderate amount of P and Cu (K240P60Cu) into the peat soil improved the starch physicochemical properties (size of the starch granules, relative viscosity, rate of sugar increase, content of ash and P), increased the tuber yield, and decreased their starchiness.--Copyright 1975, Biological Abstracts, Inc.
W76-07990

3D. Conservation In Domestic and Municipal Use

THE IMPACT OF LARGE TEMPORARY RATE CHANGES ON RESIDENTIAL WATER USE,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Dept. of Economics.
For primary bibliographic entry see Field 6D.
W76-07738

THE WATER SUPPLY OF ROME,
College of Physicians of Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W76-07819

WASTEWATER TREATMENT SYSTEM USES CALCINER.
For primary bibliographic entry see Field 5D.
W76-08024

STORM DRAINAGE AND URBAN REGION FLOOD CONTROL PLANNING,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W76-08086

PLANNING FOR THE REHABILITATION OF GRAVEL PITS,
Waterloo University, Ontario, Canada, School of Urban and Regional Planning.
For primary bibliographic entry see Field 4A.
W76-08087

OPTIMAL SIZING OF URBAN FLOOD CONTROL SYSTEMS,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W76-08092

3E. Conservation In Industry

CHEMICAL RECOVERY PROCESS FOR SPENT COOKING LIQUORS,
Hiroshima Inst. of Tech., Itsukaichi (Japan).
For primary bibliographic entry see Field 5D.
W76-07523

ANALYSIS OF SOME PHYSICAL PROPERTIES OF POULTRY PROCESSING CHILLER EFFLUENT,
Richard B. Russell Agricultural Research Center. Athens, Ga.
For primary bibliographic entry see Field 5D.
W76-07534

PERSPECTIVE ON USE OF FRESH WATER FOR COOLING SYSTEMS OF THERMOELECTRIC POWERPLANTS IN FLORIDA,
Geological Survey, Tallahassee, Fla.
G. H. Hughes.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 937, $4.00 printed copy; $2.25 microfiche. Water-Resources Investigations 43-75, December 1975. 30 p, 6 fig, 4 tab, 15 ref.

Descriptors: *Cooling water, *Thermal powerplants, *Florida, Saline water, Freshwater, Evaluation, *Water utilization, Water demand, Water conservation, Consumptive use, Heat transfer, Energy dissipation, Cooling towers.
Identifiers: *Cooling ponds, Once-through cooling.

In 1970, cooling systems of powerplants in Florida consumed about 106 mgd of water, mostly saline; however, powerplants in Florida increasingly are being located inland where saline water is not available for cooling purposes. In Florida, a cooling pond for a 1,000 megawatt nuclear powerplant operating at full load in summer consumes about 12.5 mgd of water. A cooling tower for a plant of the same size consumes about 14.8 mgd. Once-through cooling systems require 5 to 10 percent less water than cooling ponds, but the total withdrawal of water for this method is so large that it is practicable in Florida only along the coast where saline water can be used. Water consumption for power production in Florida could increase to 400 mgd by 1990 and 800 mgd by 2000. Demand also will increase greatly for other uses that require fresh water. The continued use of saline water for cooling systems of powerplants would help to conserve the fresh-water supply for these other uses. (Woodard-USGS)
W76-07596

CLOSED SYSTEM AND THE MODERN TECHNOLOGY (KUROZUDO SHISUTEMU TO GENDAI GIJUTSU),
Agency of Industrial Science and Technology, Tokyo (Japan).
For primary bibliographic entry see Field 5D.
W76-07624

WASTELESS LIQUID TREATMENT SYSTEM FOR SURFACE COATING PLANTS (HYOMEN SHORI SHISETSU NI OKERU MUHAISUI SHORI SHISUTEMU NI TSUITE),
For primary bibliographic entry see Field 5D.
W76-07625

RECOVERY OF KRAFT WHITE LIQUOR,
For primary bibliographic entry see Field 5D.
W76-07637

CHLORINE DIOXIDE PULP BLEACHING SYSTEM,
For primary bibliographic entry see Field 5D.
W76-07638

HEAVY METAL RECOVERY METHOD AND TREATMENT OF PLATING LIQUID WASTE (MEKKI HAISUICHU NO JUKINZOKU KAISHU TO SONO SHORI),
For primary bibliographic entry see Field 5D.
W76-07651

RECOVERY OF CHEMICALS FROM SULFITE WASTE LIQUORS BY MEANS OF ELECTRODIALYSIS (CHEMIKALIENRUECKGEWINNUNG AUS SULFITABLAUGEN MIT DER METHODE DER ELEKTRODIALYSE),
For primary bibliographic entry see Field 5D.
W76-07654

IN-PLANT WASTE ABATEMENT,
Allied Chemical Corp., Morristown, N.J.
For primary bibliographic entry see Field 5D.
W76-07656

THE SCAM (THE ENTERPRISES OF THE ELECTRO-MECHANICS COMP) AND THE RECYCLING OF INDUSTRIAL WATERS (LA SCAM ET LE RECYCLAGE DES EAUX INDUSTRIELLES).
For primary bibliographic entry see Field 5D.
W76-07668

THE WATER AND TOTAL OPTIMIZATIONS OF WET AND DRY-WET COOLING TOWERS FOR ELECTRIC POWER PLANTS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, V. C. Patel, and M. S. Cheng.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-252 856, $9.75 in paper copy, $2.25 in microfiche. IIHR Report No. 163, January 1975. 298 p. 97 fig., 8 tab., 61 ref., 7 append. OWRT C-4071 (No. 9015)(1)

Descriptors: *Optimization, *Design, *Cooling towers, *Powerplants, *Cost-benefit analysis, Consumptive use, Model studies, Capital costs, Methodology, Operating costs, Computer models, Water conservation, Efficiencies.
Identifiers: *Dry-wet cooling towers, Wet cooling towers.

A detailed methodology for the assessment of thermodynamic and economic efficiency of combined dry-wet mechanical draft cooling towers for large electric power plants is developed. Operating costs are considered along with capital costs in the economic analysis. The application of the methodology is demonstrated for wet cooling

towers as well as three different configurations of combined dryswet towers. Results indicate that: (1) fuel and water costs play a major role in the determination of the optimum size of both types of cooling systems, (2) use of a combination of dry-wet towers saves a considerable amount of water and reduces fogging as compared to completely wet towers, (3) for many applications, combination towers are economically competitive or superior to conventional wet towers, (4) use of dry-wet towers gives additional flexibility to site selection, (5) the water conservation, fog abatement potential, and overall economics of dry-wet cooling towers all depend on the manner in which the dry and wet portions are combined. The models developed are not restricted to any particular cooling tower design, and may be optimized to constrain either fogging or water consumption as well as economic performance. (Luedtke-Wisconsin).
W76-07674

WILL INDUSTRY MEET WATER QUALITY REQUIREMENTS,
For primary bibliographic entry see Field 5G.
W76-07736

THE PORI PROCESS: REGENERATION OF HYDROCHLORIC ACID FROM SPENT PICKLE LIQUOR,
Wean United, Inc. Warren, Ohio.
For primary bibliographic entry see Field 5D.
W76-07752

CYANIDE COMPOUND RECOVERY BY IMPACT METHOD AND REUSE OF WASTEWATER (SHOGEKIHO NI YORU SHIANKAGOBUTSU NO KAISHU TO HAISUI NO SAIRIYO),
For primary bibliographic entry see Field 5D.
W76-07753

REFINERY WASTEWATER TREATMENT AND REUSE,
Frantz Co., Houston, Tex.
For primary bibliographic entry see Field 5D.
W76-07759

WATER REUSE AND RECYCLE IN THE CDEHDED BLEACH SEQUENCE,
CIP Research Ltd., Hawkesbury (Ontario).
For primary bibliographic entry see Field 5D.
W76-07760

GEOTHERMAL ENERGY DEVELOPMENT.
For primary bibliographic entry see Field 6E.
W76-07865

IMPORTANCE OF WATER QUALITY IN THE USE OF LARGE VOLUMES OF WATER FOR CONDENSER COOLING IN POWER STATIONS,
Bhabha Atomic Research Centre, Bombay (India). Chemistry Div.
For primary bibliographic entry see Field 5B.
W76-08070

3F. Conservation In Agriculture

THE EFFECT OF IRRIGATION ON THE DEVELOPMENT OF DESERT TAKYR SOILS, (IN RUSSIAN),
M. K. Charyev.
Probl Osvoeniya Pustyn'. 6, p 11-15, 1973.

Descriptors: *Irrigation, Soils, *Crop production, Productivity, Deserts, *Sierozems, Arid lands, Fertilizers, Root system, Humus, Phosphorus, Nitrogen, *Soil physical properties, Application rates, Soil treatment.
Identifiers: *Takyr soils.

Productivity of takyr soils is improved by the efficient root system of the plants, irrigational sitting and application of fertilizers. The content of humus, P and N is increased and an increment of the developed horizon depth is observed. All these factors improve the hydrophysical properties of the soils.--Copyright 1975, Biological Abstracts, Inc.
W76-07580

WATER RESOURCES OF PIERCE COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Conservation Co and Div.
For primary bibliographic entry see Field 4A.
W76-07598

EFFECT OF SOIL MOISTURE AFTER YOUNG PANICLE FORMATION STAGE ON MINERAL COMPOSITION IN LOWLAND BROWN RICE, (IN JAPANESE),
National Food Research Inst., Tokyo, (Japan).
H. Taira, H. Taira, and S. Inoue.
Proc Crop Sci Soc Jpn. 43(2), p 135-143, 1974.

Descriptors: *Soil moisture, *Rice, Crop production, Iron, Phosphorus, Potassium, Manganese, Magnesium, Growth stages.
Identifiers: Panicle formation, Brown rice, Soils(Mineral content).

The P, K, Mg, Mn and Fe content in rice were influenced by the soil moisture conditions. The P, K, Mg and Mn contents on dry matter basis decreased with decreasing soil moisture. With decreasing soil moisture, the P and Mg contents in ash decreased and the Fe content increased. The most affected component was Mg both on dry matter basis and in ash, followed by K on dry matter basis and Fe in ash.--Copyright 1975, Biological Abstracts, Inc.
W76-07693

WATER REQUIREMENT OF POTATO,
Uttar Pradesh Inst. of Agricultural Sciences, Kanpur (India).
S. C. Yadav, and B. R. Tripathi.
Indian J Agric Sci. 43(5), p 477-482, 1973.

Descriptors: *Potatoes, Field crops, Vegetable crops, *Irrigation effects, *Water requirements, Irrigation efficiency.
Identifiers: Solanum-Tuberosum L.

Irrigation of potato (Solanum tuberosum L.) at different moisture regimes had a significant effect on tuber yield. Under wet moisture regime the average yield was 352.76 q(quintals)/ha when compared with 300.15 q/ha under moist 263.79 q/ha under dry regimes. The average consumptive use of water was 285.79, 309.90 and 345.50 mm under dry, moist and wet regimes, respectively. The consumptive use decreased with the delay in irrigation. For the wet regime that produced the best yields the irrigation requirement was 404.10 mm in 1966-67 and 313-10 mm in 1967-68. In 1967-68 only 86.28 mm total rainfall was received during the crop season. The irrigation efficiency decreased with an increase in the frequency of irrigation. The water-use efficiency was not influenced by differential irrigation treatments. It was 1.0 q/ha mm of water used/ha in both years. Copyright 1974, Biological Abstracts, Inc.
W76-07703

THE WILTING POINT AND AVAILABLE MOISTURE IN TROPICAL FOREST SOILS OF NIGERIA,
Ife Univ. (Nigeria). Dept. of Soil Sciences.
For primary bibliographic entry see Field 2G.
W76-07710

COMPARISONS OF CALCULATED AND MEASURED CAPILLARY POTENTIALS FROM LINE SOURCES,
Southern Piedmont Conservation Research Center, Watkinsville, Ga.
For primary bibliographic entry see Field 2G.
W76-07768

ASSESSMENT OF SOIL MOISTURE STORAGE FROM RAINFALL AND ITS UTILITY IN RABI CROP PLANNING IN HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 2G.
W76-07769

PROBABILITY STUDIES OF AGRICULTURAL WATER MANAGEMENT IN HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 2D.
W76-07770

AN IRRIGATION RATING FOR SOME SOILS IN ANTIGUA, W. I.,
Macdonald Coll., Montreal (Quebec).
For primary bibliographic entry see Field 2G.
W76-07963

SOIL COVER OF THE SHERABAD STEPPE, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W76-07964

THE CHEMICAL COMPOSITION OF ASPARAGUS SHOOTS AS AFFECTED BY SOIL MULCHING, (IN ROMANIAN),
Institutul Agronomic, Bucharest (Rumania).
For primary bibliographic entry see Field 2I.
W76-07968

POSSIBLE PHYSIOLOGICAL METHODS OF DIAGNOSING THE IRRIGATION TIME OF PEACH TREES, (IN RUSSIAN),
L. M. Man'Kovskaya-Tolstaya, and M. D. Kushnirenko.
Izv Akad Nauk Mold SSR Ser Biol Khim Nauk 6, p 14-20, 1974.

Descriptors: *Irrigation, *Fruit crops, *Peaches, Plant physiology, Orchards, Soil water, Leaves, Soil-water-plant relationships.

Data were obtained on the change of physiological processes of peach trees as influenced by the soil water content. A clear-cut relation between soil water content and the water deficit of shoots, water-retaining capacity of leaves and change of the content of dry matter is shown. The methods of establishing the time for irrigating peach orchards are described.--Copyright 1975, Biological Abstracts, Inc.
W76-07989

ESTIMATION OF EVAPOTRANSPIRATION FOR WATER BALANCE STUDIES IN A SEMI-ARID REGION,
Indian Agricultural Research Inst., New Delhi. Div. of Agricultural Physics.
For primary bibliographic entry see Field 2D.
W76-08067

STUDIES ON THE OPERATION OF GOBIND-SAGAR RESERVOIR,
Regional Engineering Coll., Kurukshetra (India).
For primary bibliographic entry see Field 4A.
W76-08068

A REALISTIC APPROACH TO RIVER BASIN DEVELOPMENT,
International Water Resources Association, New Delhi, India.

For primary bibliographic entry see Field 4A.
W76-08081

EQUITY CONSIDERATIONS IN CONTROLLING NONPOINT POLLUTION FROM AGRICULTURAL SOURCES,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-08094

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

PROCEEDINGS: SECOND WETLANDS CONFERENCE (HELD ON JANUARY 9, 1974 AT STORRS, CONNECTICUT),
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6E.
W76-07451

RIVER POINT DIRECTORY FOR THE MISSISSIPPI RIVER-GULF COAST INLAND WATERWAYS SYSTEM,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2L.
W76-07458

FOURMILE RUN LOCAL FLOOD-CONTROL PROJECT, ALEXANDRIA AND ARLINGTON COUNTY, VIRGINIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07469

OUTLET WORKS FOR TAYLORSVILLE LAKE, SALT RIVER, KENTUCKY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07476

TOPOGRAPHIC EXPRESSION OF SUPERIMPOSED DRAINAGE ON THE GEORGIA PIEDMONT,
Georgia State Univ., Atlanta. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W76-07553

ANALYSIS OF STRUCTURAL AND NONSTRUCTURAL FLOOD CONTROL MEASURES USING COMPUTER PROGRAM HEC-5C,
Hydrologic Engineering Center, Davis, Calif.
W. K. Johnson, and D. W. Davis.
Training Document No. 7, November 1975. 141 p, 16 fig, 9 tab, 6 ref, 1 append.

Descriptors: *Flood control, *Computer programs, *Flood plains, *Floods, Flood protection, Flood damage, Reservoirs, Channel improvement, Levees, Floodproofing, Diversion, Diversion structures, Warning systems, Flood forecasting, Relocation, Flood discharge, Hydrology, Hydraulics.

This training document illustrated how a variety of structural and nonstructural flood control measures can be analyzed using computer program HEC-5C, 'Simulation of Flood Control and Conservation System.' This document was divided into three parts. The first part discussed some basic principles of flood control planning; part II illustrated the application of many of the principles described in part I; and the third part (appendix) contained supportive computer output developed as part of the application in part II. (Sims-ISWS)
W76-07564

EXTRACTION AND UTILIZATION OF SPACE ACQUIRED PHYSIOGRAPHIC DATA FOR WATER RESOURCES DEVELOPMENT,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 4D.
W76-07566

ENVIRONMENTAL ASPECTS OF RUN-OFF AND SILTATION IN THE ANACOSTIA BASIN FROM HYPERALTITUDE PHOTOGRAPHS,
Maryland Univ., College Park.
For primary bibliographic entry see Field 4D.
W76-07568

RECONNAISSANCE OF THE WATER RESOURCES OF THE UPPER KLICKITAT RIVER BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash.
D. R. Cline.
Open-file report 75-518, 1976. 54 p, 6 fig, 11 tab, 15 ref, append.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Indian reservations, *Washington, Hydrologic data, Water quality, *Streamflow, Springs, Water wells, Water yield, Water utilization, Irrigation.
Identifiers: *Yakima Indian Reservation(Wash), *Klickitat River basin(Wash).

The upper Klickitat River basin, covering 749 sq mi in the Yakima Indian Reservation, Wash., lies immediately east of the crest of the southern Cascade Range and is dominated on its western margin by 12,276-foot Mount Adams, a glacier-mantled volcano. The Klickitat River, which flows south to the Columbia River, discharges an annual flow of about 1,200 cfs at the point where it leaves the reservation; probably about 60 percent of this is groundwater discharge. Several streams provide irrigation water to about 5,600 acres in the Camas Prairie-Glenwood area. About 12,000 acre-ft of the water was delivered by Hellroaring Ditch in 1974. The area around Mount Adams yields considerably more water per square mile than the remainder of the basin because an average of 140 in of precipitation falls on the upper slopes of this mountain, mostly as snow. Less than 30 in falls in the southern part of the basin along the Klickitat River. Groundwater in large quantities (more than 400 cfs in the fall of 1974 and mostly from the Mount Adams area) discharges into the Klickitat River canyon in a 13-mile reach in the southern part of the reservation; about one-half of the water is discharged from large springs. The largest spring discharges about 40 cfs. (Woodard-USGS)
W76-07594

PRELIMINARY REPORT ON WATER AVAILABILITY IN THE LOWER SHIP CREEK BASIN, ANCHORAGE, ALASKA--WITH SPECIAL REFERENCE TO THE FISH HATCHERY ON FORT RICHARDSON AND A PROPOSED FISH-HATCHERY SITE NEAR THE ELMENDORF AIR FORCE BASE POWERPLANT,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 8I.
W76-07595

WATER RESOURCES OF PIERCE COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Conservation Co and Div.
R. E. Brogden, F. B. Shaffer, and R. A. Engberg.
Nebraska Water Survey Paper Number 41, February 1976. 35 p.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Nebraska, Water supply, Agriculture, Irrigation, Data collections, Climatic data, Soils, Geology, Water yield, Aquifers, Streams.
Identifiers: Pierce County(Nebr).

Pierce County, in northeastern Nebraska, has an area of 576 square miles. Its economy is based on agriculture. Because precipitation is so variable, greater use of the more dependable sources of water supply is essential for maximum stabilization of agricultural productivity. This report describes the county's climate, soils, and water-bearing rocks insofar as they affect the availability and usability of streamflow and groundwater. It evaluates both types of water supply in quantitative and qualitative terms. Irrigated crops, mostly corn, totaled 15,600 acres during 1955-70. Water for irrigation was pumped from streams at 52 locations and from 146 wells. The average yield of irrigated corn ranged from 50 to 101 bushels per acre. (Woodard-USGS)
W76-07598

WATER-RESOURCES RECONNAISSANCE OF ST. GEORGE ISLAND, PRIBILOF ISLANDS, ALASKA.
Geological Survey, Anchorage, Alaska.
G. S. Anderson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 365/As $3.50 printed copy; $2.25 microfiche. Water-Resources Investigations 76-6, January 1976. 15 p, 4 fig, 2 tab, 2 ref.

Descriptors: *Water resources, *Surveys, *Alaska, *Surface waters, *Groundwater resources, Water quality, Water supply, Available water, Aquifer characteristics, Islands, Lakes, Potable water, Salinity.
Identifiers: St. George Island(Alaska).

A hydrologic reconnaissance of St. George Island, Pribilof Islands, Alaska, was made in May 1974 to determine the feasibility of locating a source of water containing less sodium chloride than the present supply. The existing wells are apparently either too deep relative to sea level or too close to the ocean; they may be pumping from a transition zone between the freshwater and saltwater bodies. Other than a few lakes on the island, surface-water availability is limited. However, the presence of several freshwater springs suggests that groundwater of good quality does exist on the island. The island is relatively narrow, the rate of recharge is low, and the rocks are permeable; it is therefore concluded that the freshwater lens is thin. Fresh groundwater should be obtainable near the center of the island. However, production wells should be designed so as to skim freshwater from near the top of the lens. (Woodard-USGS)
W76-07601

SURVEY OF IRRIGATION CANAL ECOLOGICAL PARAMETERS INFLUENCING AQUATIC WEED GROWTH,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
N. E. Otto.
Report No. REC-ERC-759, May 1975. 65 p. 11 fig., 22 tab., 52 ref., 2 append.

Descriptors: *Aquatic weed control, *Irrigation canals, Submerged plants, *Colorado, *California, *Washington, Water chemistry, Nitrogen, Iron, Dissolved solids, Algae, Limiting factors, Rooted aquatic plants.

Comprehensive studies of water chemistry, hydrosoils, light penetration, and biological populations were conducted in 11 irrigation canals in Colorado, California, and Washington in order to determine the ecological factors that promote submersed weed growth. The plants were dominantly pondweeds with numerous subdominant species. Filamentous green algae also commonly grow among the weeds but are seldom as dominant as they are on concrete-lined canals. The most significant differences between canals supporting weeds and those that did not were that those without weeds had 70% less available nitrate-nitrogen, 71% less total iron, and 40% less total dissolved solids. All other measured parameters were statistically similar. Small statistical differences occurred in waters that had greater amounts of calcium, magnesium, and anions other than nitrates but the variations between individual ions were small. Dissolved oxygen levels were found to be at saturation or greater. Free carbon dioxide was seldom found because of the greater alkalinity of the waters, which had pH levels of 7.4 to 8.1. The indications are that measurable increases of mineral nutrient input was the major factor in causing greater incidence of weed growth and should be considered wherever irrigation return flows and urban sewage effluents enter irrigation waters. (Auen-Wisconsin).
W76-07609

LAND DRAINAGE AS A FACTOR IN 'RED TIDE' DEVELOPMENT,
Department of the Environment, Ottawa (Ontario). Shellfish Water Quality Div.
For primary bibliographic entry see Field 5C.
W76-07616

WATER RESOURCES ISSUES AND THE 1972 UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-07688

EFFECT OF FLOODING ON THE REGENERATION OF SIX TROPICAL GRASSES AFTER DEFOLIATION,
Department of Primary Industries, Brisbane (Australia). Soil Conservation Branch.
E. R. Anderson.
Queensl J Agric Anim Sci. 31(1), p 25-29, 1974.

Descriptors: *Grasses, Tropical regions, *Flooding, Mortality, Growth rates, Australia, Vegetation regrowth.
Identifiers: Biloela, Cenchrus-Ciliaris, *Cultivars, *Defoliation, Panicum-Coloratum, Panicum-Maximum, Tarewinnabar, Urochloa-Mosambicensis.

The effect of flooding immediately and 15 days after defoliation on the survival and growth of Panicum coloratum, P. maximum, Urochloa mosambicensis and 3 Cenchrus ciliaris cultivars ('Biloela,' 'Molopo' and 'Tarewinnabar') was studied in a pot experiment at Mackay, Queensland Australia. Floiding immediately after defoliation was more deleterious to plant survival and production than flooding 15 days later. P. coloratum had greater flood tolerance than the other grasses.--Copyright 1975, Biological Abstracts, Inc.
W76-07696

FLOOD PLAIN INFORMATION: CLINTON RIVER AND PAINT CREEK, OAKLAND COUNTY, MICHIGAN.
United States Lake Survey, Detroit, Mich.
Prepared for the Water Resources Commission, Michigan Department of Natural Resources, and the Oakland County Planning Commission. April 1973. 36 p, 11 fig, 17 plates, 6 tab.

Descriptors: *Floods, Flooding, *Flood profiles, *Flood stages, *Flood plains, Obstructions to flow, Non-structural alternatives, Flood flow, River forecasting, Flood forecasting, Historic floods, Flood data, Peak discharge, Flow duration, Rivers, Ice jams, Flood plain zoning, Channel improvement, *Michigan.
Identifiers: *Clinton River(MI), Paint Creek(MI), Pontiac(MI), Rochester(MI), Auburn Heights(MI), Intermediate Regional Flood, Standard Project Flood.

Most development along these streams is located in Pontiac, Rochester and Auburn Heights. Besides residences there is some industry and commerce, and considerable undeveloped land in the flood plains. Paint Creek with a drainage area of 71.8 sq mi joins Clinton River at Rochester. Clinton River drains 760 sq mi, 299 of which are below the study area's lower limits. Winter and spring floods result from heavy rains. In summer intense local thunderstorms can cause large floods. The April 1947 flood is the greatest known on the Clinton River, but adequate data concerning its severity is missing. The second largest flood in June 1968 had a recorded peak flow of 1,400 cubic ft/sec at Auburn Heights. On Paint Creek at Rochester the highest recorded flood in February 1968, with a peak flow of 918 cfs, resulted from combined heavy snowmelt and rainfall. In an Intermediate Regional Flood a peak discharge of 6,100 cfs can be expected on Clinton River at Oakland-Macomb County line with 2,355 cfs expected on Paint Creek at its confluence with Clinton River. Channel velocities for Clinton River may range from 6 to 11 ft/sec. This flood would peak in 14 hours and last 12 hours above bankfull. In a Standard Project Flood peak discharges of 25,000 and 10,950 cfs are predicted on Clinton River and Paint Creek, respectively. Channel velocities in Clinton River could range up to 16.7 ft/sec with 3 ft/sec in the overbank area. This flood would peak in 21 hours and last 72 hours. Many bridges would obstruct flood flow. Pontiac has spent millions to Clinton River channel within the city limits and has adopted subdivision ordinances restricting building adjoining open drains and streams. (Smith-North Carolina)
W76-07720

FLOOD PLAIN INFORMATION: NORTH YUBA AND DOWNIE RIVERS, DOWNIEVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for Sierra County, California, January 1975. 29 p, 15 fig, 17 plates, 8 tab.

Descriptors: *Floods, Flooding, *Flood forecasting, Overflow, Streamflow forecasting, Maximum probable flood, *Flood profiles, Cloudbursts, Historic floods, Flood data, Flood frequency, Flood stages, *Peak discharge, Flood peak, Flow duration, Flood damage, Deposition(Sediments), Flood plains, Obstructions to flow, Building codes, *California.
Identifiers: Donnieville(CA), *North Yuba River(CA), *Downie River(CA), Standard Project Flood, Intermediate Regional Flood, Pauley Creek(CA).

The study area comprises the flood plains and immediately adjoining areas along North Yuba River between Goodyears Bar and the mouth of Slate Castle Creek (about 6 miles) and the Downie River from its mouth upstream to the mouth of Pauley Creek (1 mile). Lumbering, recreation, retail trade and Sierra County government are important to the economy. Except for downtown Downieville, development is very light. The approximate drainage area of the streams is 245 square miles. General rainfloods resulting from prolonged heavy rain over the tributary area and characterized by high peak flows of moderate duration can occur in the study area anytime from November through March. The largest flood on record occurred in 1963 when 19 inches of rain was deposited in the upper Yuba River Basin. Peak discharge on the North Yuba River at lower end of study area was 40,000 cfs. Damage included the destruction of homes and commercial properties, roads, bridges and domestic water supply facilities. In an Intermediate Regional Flood it is predicted that peak flows of 50,000 cfs will be reached with water velocities ranging from 10 to 25 ft/sec in the main channel and up to 10 ft/sec in the overbank area. It is anticipated that flood peak will be reached in about 5 hours and with duration above flood stage of 9 hours. In a Standard Project Flood a peak discharge of 66,000 cfs is predicted with time of rise around 6 hours and the duration above flood stage about 14 hours. Two of the five bridges in the study area are considered obstructive to major floods. To date there are no existing or authorized Federal flood control structures that would reduce flood damage. (Smith-North Carolina)
W76-07721

FLOOD PLAIN INFORMATION: ROCK RIVER-POPLAR CREEK, LUVERNE AND VICINITY, MINNESOTA.
Army Engineer District, Omaha, Nebr.
Prepared for the City of Luverne, Rock County and the State of Minnesota. June 1972. 43 p, 17 fig, 6 plates, 8 tab.

Descriptors: *Floods, *Flood flow, *River flow, *Flood profiles, *Peak discharge, *Flood plains, Obstructions to flow, Flooding, Regional flood, Streamflow forecasting, Historic floods, Flood data, Ice jams, Tributaries, Land use, *Minnesota.
Identifiers: *Rock River(MN), Poplar Creek(MN), Luverne(MN), Standard Project Flood, Intermediate Regional Flood.

The flood plain in this study area contains residential, commercial, industrial and agricultural developments which have been severely damaged by floods. Further urban expansion could worsen such damage. Poplar Creek which drains less than 3 sq mi is a tributary of Rock River, a tributary of the Missouri River, with a drainage area of 430 sq mi at Luverne. Major floods occur mainly in spring, with the highest flood occuring in 1969 when a peak discharge of 19,500 cubic feet per second was recorded. Snowmelt combined with rainfall is usually the cause of flooding. Since 1882, 6 floods of significant size have occurred. A flood in 1914 caused damaged estimated at $200,000. In past floods bridges have been washed out, thousands of turkeys have been killed, and many areas of the city of Luverne have been flooded. Floods rise to peak flow in 5 to 8 hours on the river with high velocities in the channel. In an Intermediate Regional Flood a peak discharge of 26,200 cfs on Rock River, and 2250 cfs on Poplar Creek are expected along with water velocities up to 5.6 ft/sec in the channel and up to 4.5 ft/sec in overbank areas. Most of 17 briges in the area would be obstructive to flow. This flood would rise to peak in 5 hours and last 12 hours above critical stage. In a Standard Project Flood a peak discharge of 64,800 cfs and 6290 cfs are expected on Rock River and at the mouth of Poplar Creek respectively, with bridges being even more obstructive. This flood would reach peak in 8 hours and last 25 hours. A dam upstream has no flood control capacity, and there are no other flood control structures in the study area. (Smith-North Carolina)
W76-07722

FLOOD PLAIN INFORMATION: KETTLE CREEK, WAYCROSS AND WARE COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for Waycross and Ware County, Georgia, July 1971. 46 p, 23 fig, 21 plates, 15 tab.

Descriptors: *Floods, *Flood profiles, *Flood plains, Flow characteristics, *Flow duration, *Flood damage, Hurricanes, Historic floods, Flood frequency, Flood stages, Peak discharge, Channels, Warning systems, Channel improvement, *Georgia.

Identifiers: Waycross(GA), Ware County(GA), Kettle Creek(GA), Satilla River(GA), Intermediate Regional Flood, Standard Project Flood.

With a drainage area of 32 sq mi at its mouth, Kettle Creek has its headwaters in Cluffs Bay, southwest of Waycross, and flows in a northerly direction to its confluence with the Satilla River, north of Waycross. Streams in the study area, including 3 short tributaries, slope at an average rate of 5 feet/mile, flowing through a rapidly urbanizing area. Extensive commercial, industrial, and residential development exists in the flood plains. Channel dredging and maintenance have kept Kettle Creek in a well defined channel in the more developed areas. Twelve bridges and/or culverts, debris, shrubbery, and sand deposits can obstruct flood flows. In September 1964 Hurricane Dora dumped 7.03 inches of rain on Ware County and caused extensive damage to buildings and streets in Waycross. Installation of a gaging station at Cherokee Avenue in 1966 provides data on floods on Kettle Creek. The Intermediate Regional Flood is characterized by an estimated peak discharge of 3,505 cubic feet per second, at Cherokee Avenue, channel velocities of 8 ft/sec, and overbank velocities of 2 ft/sec. The IRF can be expected to rise 15 feet in 8 hours and remain above bankfull for 18 hours; 20 buildings and 750 acres would be flooded. The Standard Project Flood would have a peak discharge of 8,764 cfs and channel and overbank velocities of 13 and 3 ft/sec respectively. SPF would flood 56 buildings and 1370 acres. It would rise 16 feet in 12 hours and remain above bankfull for 24 hours. (Henley-North Carolina)
W76-07723

FLOOD PLAIN INFORMATION: HURRICANE CREEK, ALMA AND BACON COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for the City of Alma and Bacon County, Georgia, May 1971. 35 p, 8 fig, 28 plates, 14 tab.

Descriptors: *Floods, *Flood plains, Channels, *Flood profiles, *Flood forecasting, *Flood stages, Hurricanes, Historic floods, Flood data, Peak discharge, Flow duration, Flow characteristics, Flood damage, Warning systems, *Georgia.
Identifiers: Hurricane Creek(GA), Bacon County(GA), Alma(GA), Jeff Davis County(GA), Standard Project Flood, Intermediate Regional Flood.

The flood situation in the City of Alma and Bacon County, Georgia, along Hurricane Creek from about two miles downstream of the Highway 32 bridge to County Highway S608, a distance of about 9 miles, plus portions of two tributary streams along this reach of the Creek is examined. Hurricane Creek (drainage area 170 sq mi) slopes at an average of 2.8 ft/mi in the study area and flows through Alma in 3 or 4 poorly defined channels averaging 45 feet in width and 2 feet in depth. Tributary streams have channels averaging 10 feet wide and 3 feet deep. Except for several large subdivisions built in recent years near the flood plains between Highways 32 and 1, there is only scattered development in or near the flood plains. Shrubs, debris, sand and silt deposits, 5 bridges and culverts can obstruct flood flows during the Intermediate Regional Flood. Flows have exceeded bankful 28 times since 1951 with a maximum discharge of 4,450 cubic feet per second occurring in September 1953 when Hurricane Florence dumped 9.08 inches of rain on the study area in six days. Hurricane Creek rose 5.5 feet in 8.4 hours and remained above bankful for 6 days. Peak discharge during IRF and the Standard Project Flood would reach 12,500 and 31,400 cfs respectively. The IRF would rise 11 feet in 96 hours and would remain above bankfull for 8 days. Eleven structures and 2,100 acres would be flooded. Channel and overbank velocities would reach 4.6 and 2.1 ft/sec respectively. The SPF would typically rise 19 feet in 120 hours and remain above bankfull for 10 days, inundating 26 structures and 2,500 acres. (Henley-North Carolina)
W76-07724

FLOOD PLAIN INFORMATION: LITTLE CRAB ORCHARD CREEK AND PILES FORK CREEK, CARBONDALE, ILLINOIS.
Army Engineer District, St. Louis, Mo.
Prepared for Carbondale, Illinois, July 1970. 58 p, 15 fig, 16 plates, 12 tab.

Descriptors: *Floods, Flooding, *Flood profiles, *Flood plains, Streamflow forecasting, Historic floods, Peak discharge, Flood peak, Flow duration, Reservoirs, Channel improvements, *Illinois.
Identifiers: Little Crab Orchard Creek(IL), Piles Fork Creek(IL), Carbondale(IL), *Standard Project Flood, *Intermediate Regional Flood, Big Muddy River(IL), Glades Creek(IL).

Carbondale lies between the watersheds of Little Crab Creek and Piles Fork with the northeast section of the city subject to flooding due to the low, flat terrain and the poor and inadequate drainage system. Only small amounts of commercial and residential development are on the flood plains, but the land is suitable to more development. Most floods occur in spring and summer and result from heavy rains. There are no stream gage records for these streams. The 1933 flood on Little Crab Orchard Creek was the biggest in memory and on Pile Fork the 1969 flood was quite substantial. In 1961 flooding in the lower reaches of both creeks occurred when water backed up from Big Muddy River. During an Intermediate Regional Flood peak discharges of 2000 cfs and 1600 cfs are expected on Little Crab Orchard Creek and Piles Fork respectively, and water velocities of 7 ft/sec in the channel and 2 to 3 ft/sec in the overbank. The flood would rise in about 10 hours and remain 14 to 16 hours above floodstage. In a Standard Project Flood a peak discharge of 3600 cfs on Little Crab Orchard Creek and 2700 cfs on Piles Fork is expected, with water velocities of 9 ft/sec in the channels and 3 ft/sec in overbank areas. Flood peak would be reached in 22 hours and waters would remain above floodstage from 23 to 24 hours. The five bridges and culverts of Little Crab orchard Creek would cause some obstruction to flow in major floods, as would the 14 bridges or culverts and one pipeline bridge across Piles Fork. Some channel improvement has been done on both creeks and more is expected. On Piles Fork there is the Carbondale Reservoir which was built for water supply and has a fixed spillway. (Smith-North Carolina)
W76-07725

FLOOD INSURANCE STUDY: PLEASANTON, ALAMEDA COUNTY, CALIFORNIA, (PRELIMINARY REPORT),
Army Engineer District, San Francisco, Calif.
Prepared for the Federal Insurance Administration, May 1972. 7 p, 13 plates, 2 tab.

Descriptors: *Floods, *Flood profiles, *Flood peak, *Flood plains, *Flood plain insurance, Flooding, Streamflow forecasting, Dams, Channel improvement, *California.
Identifiers: Pleasanton(CA), *Pleasanton Canal(CA), Alameda County(CA), Arroyo Mocho(CA), Tassajara Creek(CA), *Flood insurance, Chabot Canal(CA), Del Valle Dam(CA).

The City of Pleasanton is a residential community of 22,250 situated in the Amador Valley of Central Alameda County. A portion of Pleasanton's developed area is situated at the low point of the valley floor which is an historical flood plain fed by a number of natural streams. The contributing drainage area is 405 square miles. Data for this report was synthesized from basin characteristics as no stream flow gage is installed in the study area. Allowance has been made for channel improvements and construction of Del Valle Dam located 7 miles southwest of the city. The study area is divided into 4 zones. Zone A would be subject to a 100 year flood; Zone B would be subject to a Standard Project Flood; Zone C is not subject to flooding; and Zone D must be studied further. Flood profiles included show the 100 year flood, a Standard Project Flood, and a 10 year flood. Floodways were developed for all areas considered and included sections of Arroyo de la Laguna, Arroyo Mocho, and Chabot Canal. Areas not considered but which appear to qualify for floodway analysis are the Pleasanton Canal, Tassajara Creek and another section of the Arroyo Mocho. Floodway computations were based on conditions assuming the floodway fringe was filled or otherwise blocked and that the floodway area was unobstructed. It was designed to pass the 100 year storm with approximately 1 foot rise. Velocities in the floodway fringe are expected to be 1 to 2 ft/sec. Future study by the City would likely revise this floodway. (Smith-North Carolina)
W76-07726

FLOOD PLAIN INFORMATION: MINNESOTA RIVER AND TRIBUTARIES, MANKATO, NORTH MANKATO, LE HILLIER.
Army Engineer District, St. Paul, Minn.
Prepared for Mankato, North Mankato, and Le Hillier, Minnesota. October 1973. 43 p, 35 fig, 19 plates, 5 tab.

Descriptors: *Floods, *Flood profiles, *Peak discharge, Flood peak, *Flood plains, Tributaries, *Flood protection, Flooding, Flood flow, Streamflow forecasting, River forecasting, Storms, Historic floods, Flow duration, Rivers, Floodways, Obstructions to flow, Flood plain zoning, Levee, Dikes, Reservoirs, Erosion control, Channel improvement, *Minnesota.
Identifiers: *Minnesota River(MN), Mankato(MN), Le Hillier(MN), North Mankato(MN), *Blue Earth River(MN), Standard Project Flood, Intermediate Regional Flood.

Four major floods in the last 22 years have caused heavy damages in the flood plains along the streams of this study, principally in Mankato, a city of 150,000 people. The Blue Earth River, with a drainage area of 3550 sq mi, is a tributary of the Minnesota River which drains 14,900 sq mi above Mankato. Storms most often occur in the spring when rivers can be fed by heavy snowmelt and rains, though in summer rainstorms of short duration and high intensity are common. The maximum spring flood occurred in 1965 when a peak discharge of 94,100 cubic ft/sec was reached. The highest summer flood, in 1908, had a peak discharge of 54,500 cfs. Dikes have been constructed prior to some floods and are generally removed after danger of flooding passes. It is possible to build these temporary structures because of the warnings which are given on snowmelt conditions. In an Intermediate Regional Flood a peak discharge of 105,000 cfs is predicted on the Minnesota River. This flood would rise in 6 days to peak and last 18 days at critical stage. The Standard Project Flood would have a peak discharge of 155,000 cfs. It would rise to peak in 11 days and last 20 days. A considerable portion of built-up areas would be subject to flooding from either flood. Aside from levees which have been constructed from time to time, a Federal Flood Control Project is now being constructed. Phase 1 consists of flood barriers with supporting interior drainage facilities to protect the entire flood prone areas in the three cities. It will provide protection against a flood of the 1965 height. Phase 2 would be a series of upstream reservoirs to provide protection against even larger floods. (Smith-North Carolina)
W76-07727

FLOOD PLAIN INFORMATION: GRAND RIVER, GRAND RAPIDS, MICHIGAN AND VICINITY.
United States Lake Survey, Detroit, Mich.

Prepared for Water Resources Commission, Michigan Department of Natural Resources, and Grand River Watershed Council. 1972. 39 p, 23 fig, 14 plates, 6 tab.

Descriptors: *Floods, *Flood profiles, *Flood stages, *Flood plains, Flooding, Flood flow, Streamflow forecasting, Historic floods, Flood data, Peak discharge, Rivers, Levee, Floodwalls, *Michigan.
Identifiers: *Grand River(MI), Grand Rapids(MI), Standard Project Flood, Intermediate Regional Flood.

The Grand River flood plain at Grand Rapids is highly developed and pressure is great to continue development of industrial, business and residential areas. The Grand River is fed by 6 major and numerous minor tributaries including the Rogue, Flat, Maple, Thornapple, Lookingglass, and Red Cedar Rivers with drainage areas of 255, 550, 970, 875, 290, and 402 sq mi, respectively. Only the Rogue joins the Grand River within the study limits. The Grand River has a drainage of 5063 sq mi above the lower limit of the study area and drains into Lake Michigan. Its relatively flat gradients increase the risk of floods which are usually caused by winter and spring rains coupled with snowmelt. The largest flood occurred in 1904 when a peak discharge of 54,000 cubic ft/sec was recorded and flooding reached disastrous proportions. The largest recent flood was in 1948 with a peak discharge of 42,200 cfs with the flood level 2.5 feet less than the 1904 flood. In an Intermediate Regional Flood a peak discharge of 61,000 cfs is expected with water velocities of 7.4 ft/sec in the main channel and 1.2 ft/sec in the overbank area. This flood would rise from critical stage to peak in 44 hours and last 98 hours above critical stage. During a Standard Project Flood a peak discharge of 151,000 cfs is expected with water velocities up to 9 ft/sec in the channel and 1.4 ft/sec in the overbank area. This flood would rise in 64 hours and remain 153 hours. In addition to obstruction caused by bridges in large floods there are four low dams across the river which obstruct flood flow somewhat. Floodwalls and levees, built after the 1904 flood, have helped protect Grand Rapids, but increase flood stages upstream. (Smith-North Carolina)
W76-07728

FLOOD PLAIN INFORMATION: MISSISSIPPI RIVER-SAUK RIVER-WATAB RIVER, VICINITY OF ST. CLOUD, MINNESOTA.
Army Engineer District, St. Paul, Minn.
Prepared for St. Cloud Metropolitan Area Planning Commission, September 1974. 23 p, 12 fig, 13 plates, 6 tab.

Descriptors: *Floods, *Flood profiles, Rivers, Flood plains, Tributaries, *Mississippi River, Floodwater, Flooding, River forecasting, Historic floods, Flood data, Peak discharge, Flow duration, Ice jams, Obstructions to flow, *Minnesota.
Identifiers: *Sauk River(MN), *Watab River(MN), St. Cloud(MN), Sartell(MN), Sauk Rapids(MN), Intermediate Regional Flood, Standard Project Flood.

Properties along banks of the 3 rivers vary in their state of development. Along the Mississippi steep banks have discouraged development, though there are some residences and commercial development in St. Cloud and Sartell. Along the Sauk heavily wooded sections have forced building to occur in open flood plain areas with more development expected. Along the Watab development is mostly beyond the flood plain. The Watab, which drains 85 sq mi, and the Sauk, with a drainage area of 970 sq mi, are tributaries of the Mississippi with a total drainage of 13,320 sq mi in or above this study area. Floods generally occur in spring though they can occur at anytime. Conditions which lead to flooding are frozen saturated ground, rapid snowmelt, and rain. In an Intermediate Regional Flood peak discharges of 57,500 cubic ft/sec on the Mississippi, 10,300 cfs on the Sauk and 1880 cfs on the Watab are predicted with water velocities ranging from 4 to 12 ft/sec. This flood would rise in about 11 days to flood peak and last 30 days. Most of the 14 bridges and culverts crossing the area streams are obstructive to this flood. Ice jams at bridges can cause backup and deepening of flood waters. During a Standard Project Flood peak discharges of 100,000 cfs, 20,300 cfs, and 5,000 cfs are predicted on the Mississippi, Sauk, and Watab Rivers respectively. This flood would rise to peak in 30 days and last about 50 days. Damage in either major flood could be extensive. Reservoirs at the Mississippi headwaters, built in the late 19th century, provide little protection from floods, and there are no existing flood ordinances to prevent building in flood prone areas. (Smith-North Carolina)
W76-07729

FLOOD PLAIN INFORMATION: YALOBUSHA RIVER AND TRIBUTARIES, GRENADA, MISSISSIPPI.
Army Engineer District, Vicksburg, Miss.
Prepared for the City of Grenada, and Grenada County, Mississippi. March 1972. 41 p, 18 fig, 21 plates, 8 tab.

Descriptors: *Floods, Flooding, *Flood profiles, Frail lands, *Flood plains, Dams, Regional flood, *Flood flow, Streamflow forecasting, Flood data, Flood waves, Flow duration, Bank erosion, Water storage, Channel improvement, *Mississippi.
Identifiers: *Yalobusha River(MS), Grenada(MS), Riverdale Creek(MS), *Grenada Lake project(MS), Perry Creek(MS), Batupan Bogue(MS), Grenada Dam(MS).

In and near the city of Grenada there has been some flood plain encroachment, mostly in the low lying areas near Batupan Bogue. Grenada is bounded by Perry Creek and Batupan Bogue to the east and south. Riverdale Creek enters Yalobusha River a short distance north of Grenada. Yalobusha River drains a total of 2050 square miles, 1320 sq mi of this above Grenada Dam which does much to protect the city. Batupan Bogue, the major tributary of Yalobusha River and the cause of most of the flood in the area, is undergoing adjustment in its stability and meanders through a bank carving process which is working upstream. Before completion of the Grenada Lake project in 1954, the largest flood occurred in 1948 with a peak discharge of 78,900 cubic feet/sec. A 1961 flood had a discharge of 50,000 cfs. An Intermediate Regional Flood could be caused by rain amounting to 6 inches in 6 hours and 9 inches in 24 hours. On Yalobusha River crest would be 2.4 ft higher than the 1961 flood and 1.5 ft on Batapan Bogue. A Standard Project Flood could result from rains varying from 9.7 inches in 6 hours to a total of 18.1 inches in 48 hours. It would be 6.1 feet higher than the 1961 flood with channel velocities of 18 ft/sec on Batupan Bogue and 11 ft/sec in Yalobusha River with velocities of 3 ft/sec in overbank areas. Heavy growth in some channels retards streamflow. Aside from the dam, few flood damage prevention measures have been undertaken, though the channel of Yalobusha River has been improved. (Smith-North Carolina)
W76-07730

FLOOD PLAIN INFORMATION: CEDAR CREEK, ATHENS AND CLARKE COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for Athens and Clarke County, Georgia, June 1969. 34 p, 8 fig., 13 plates, 13 tab.

Descriptors: *Floods, *Flood stages, *Flash floods, *Flood profiles, Historic floods, Flood data, Peak discharge, Flood duration, Flow characteristics, Flood damage, *Bank erosion, *Flood damages, Flood forecasting, *Georgia.
Identifiers: *Cedar Creek(Ga), Clarke County(Ga), Athens(Ga), Intermediate Regional Flood, Standard project flood, Oconee River(Ga).

The study limits of Cedar Creek on the eastern outskirts of Athens are from its confluence with the Oconee River to its headwaters, a distance of about 6 miles. Tributary A which enters just above Old Lexington Road and Tributary B which enters 0.5 miles upstream are included. Average slope of the creek is about 37 ft/mile with a flood plain ranging in width from 100 to 300 ft. The upper reaches of Cedar Creek drain developed residential areas close to Tributary A. New development below Old Lexington Road is built high on valley slopes. Expansion of Athens is expected to increase pressure for building in the flood plain. The most severe flood in recent years occurred in May 1966. Over 9 inches of rain fell in a 5 hour period. Flash floods damaged homes and business establishments in the Athens area. Streets and culverts were heavily damaged. Bank erosion was severe along Cedar Creek. Using statistical studies of nearby streams the Intermediate Regional Flood and the Standard Project Flood are expected to have peak discharges of 3,620 and 10,800 cubic feet per second, respectively. The IRF would rise 13 feet in 9 hours and remain above bankfull for 16 hours, flooding 8 buildings and 135 acres. Channel and overbank velocities would reach 11 and 3 ft/sec., respectively. SPF would inundate 15 buildings and 160 acres and would rise 19 ft. in 12 hours and remain above bankful for 22 hours. Channel and overbank velocities would reach 15 and 5 ft/sec., respectively. The Standard Project Storm could produce 19.9 inches of rain in 96 hours. (Henley-North Carolina)
W76-07731

FLOOD PLAIN INFORMATION: FRESNO RIVER AND COTTONWOOD, LITTLE DRY, AND ROOT CREEKS, MADERA, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Madera County, CA, June 1973. 54 p, 27 fig, 38 plates, 9 tab.

Descriptors: Flooding, *Flash floods, *Flood profiles, *Flood plains, Non-structural alternatives, Streamflow forecasting, Cloudbursts, Flood data, Flood frequency, Flood damage, Erosion, Deposition, Flood plain zoning, Flood plain insurance, Zoning, Levee, Dams, Channel improvement, Obstructions to flow, Floodways, *California.
Identifiers: *Fresno River(Ca), Cottonwood Creek(Ca), Little Dry Creek(Ca), Root Creek(Ca), Madera(Ca), *Hidden Lake(Ca), Intermediate regional flood, Standard project flood.

Flood records of this study area show that damaging floods have occurred in 11 of the last 35 years. Lands are used primarily for irrigated crops, orchards, vineyards and grazing of cattle. Residential, commercial and manufacturing zones are present in Madera and the community is expanding into agricultural areas. The streams in the study area drain about 400 square miles. Floods in the past have resulted from prolonged rain, generally in late spring to early fall, but also in winter. Cloudbursts storms can result in high peak flows, with short floodflow duration, greater than those of general flood-producing storms. Two stream gages have been in operation since 1915 and 1941. The largest floods on record occurred in 1955 and 1969 with peak flows of 17,500 and 17,300 cubic feet per second, respectively. In the 1969 flood residential damage was $535,000. Hidden Lake, is scheduled to be completed on the Fresno River in 1975. It will serve as a multipurpose flood control, including a dam. In the Intermediate Regional Flood peak flows of up to 34,000 cfs can be expected without the dam and velocities of 4 to 8 feet per second. With the dam flows of 5000 cfs and velocities of 3 to 5 feet per second are forecast. A Standard Project Flood without the dam would result in flows of up to 49,000 cfs, and with the dam, flows of 21,000 cfs may be expected. Numerous bridges and culverts would be obstructions to flow in a Standard Project Flood without the dam in place, but with the dam these problems are reduced considerably. Madera Coun-

ty is adopting a flood plain ordinance and does have general zoning applicable to stream channels and river bottoms. (Smith-North Carolina)
W76-07732

FLOOD PLAIN INFORMATION: MILL SLOUGH, OSCEOLA AND ORANGE COUNTIES, FLORIDA.
Army Engineer District, Jacksonville, Fla.
Prepared for the Board of County Commissioners of Osceola County, June 1973. 37 p, 18 fig, 8 plates, 5 tab.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Flood damage, Flow characteristics, Warning systems, Control structures, Channels, Flow duration, Peak discharge, Flood stages, Flood data, Storms, Hurricanes, Runoff, *Florida.
Identifiers: Osceola County(FL), Kissimmee(FL), *Mill Slough(FL), Lake Tohopekaliga(FL), North City Ditch(FL), County Canal(FL), Orange County(FL), Intermediate Regional Flood, Standard Project Flood.

Located in Osceola County, Florida, (population 25,267) Mill Slough drains an area of about 14 sq mi and flows southerly from its origin in a swampy area for about 4 miles, discharging into Lake Tohopekaliga. Floods on Mill Slough are controlled to some extent by the water level of Lake Tohopekaliga which is regulated by the Central and Southern Florida Flood Control District. North City Ditch and County Canal, constructed by the City of Kissimmee to intercept runoff which flows from the northern drainage basin of Mill Slough and direct the flow around Kissimmee, do not prevent flooding. Flood plains in the upper reaches of Mill Slough are sparsely developed agricultural lands. The lower reaches in and near Kissimmee have flood plains well developed with commercial, residential, and light industrial uses. Vegetation and bridges can obstruct flood flows. Major floods have occurred during various seasons of the year; the greatest recorded flood occurring in October 1956 when 16.28 inches of rain fell in a 24 hour period. Damages were estimated at $1 million. Flood flows can rise to extreme flood peak in a short time. The Intermediate Regional Flood and the Standard Project Flood would have peak discharges of 1,500 and 2,000 cubic feet per second at the mouth of Mill Slough. The IRF would have overbank velocities of up to 6 ft/sec and channel velocities of 3-7 ft/sec and flood 360 developed acres and 540 structures. The IRF would typically have maximum rate of rise of 0.3 ft/hour and have a duration of critical stage of 41 hours. The SPF would flood 900 structures and 640 acres of built up area. It would rise at 0.4 ft/hour and remain at critical stage for 55 hours. (Henley-North Carolina)
W76-07733

FLOOD PLAIN INFORMATION: BIG THOMPSON RIVER, LOVELAND, COLORADO.
Army Engineer District, Omaha, Nebr.
Prepared for Loveland, December 1971. 21 p, 9 plates, 2 tab.

Descriptors: *Flood plains, *Floods, *Peak discharge, *Flood profiles, Channels, Snowmelt, Flood flow, Flood data, Historic floods, Flood stages, Flow duration, Flow characteristics, Erosion, *Colorado.
Identifiers: *Big Thompson River(Co), Larimer County(Co), Loveland(Co), Buckhorn Creek(Co), Fall River(Co), Glacier Creek(Co), South Platte River(Co), Intermediate Regional Flood, Standard project flood.

Big Thompson River flows easterly from the mountains of the Colorado Front Range to join South Platte River southwest of Greeley, Colorado. That portion studied in this report extends from the eastern edge of the foothills to a point 8 miles downstream. Flowing through the city of Loveland (population 16,220) in Larimer County, this portion of Big Thompson River drains an area of 509 sq mi and has an average slope of 19 ft/mi. The channel is from 4 to 10 ft deep and from 50 to 200 ft wide. Flood plain development includes agriculture, gravel mining operations, commercial facilities, and a few residential acreages. Future growth in Loveland and Larimer County is expected to force further flood plain development. Elevated roadways and irrigation diversion structures will obstruct floodflows. The cause of floods is usually intense rainfall in the late spring and summer with the possibility of rainfall runoff being increased by snowmelt in May and June. The largest known flood occurred in August 1951 with an estimated peak discharge of 22,000 cubic feet per second at Loveland. This flood resulted in four deaths and $602,000 damage to homes, crops, and highways. The Intermediate Regional Flood and the Standard Project Flood will have peak discharges of 19,000 and 44,000 cfs, respectively. Overbank velocities during IRF will be 1.5-3.5 ft/sec. Erosion will be the major source of future flood damage. (Henley-North Carolina)
W76-07734

STRATEGIES FOR NATURAL RESOURCE DECISION MAKING: INTERIM REPORT TO THE NEW ENGLAND GOVERNOR'S CONFERENCE.
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6B.
W76-07735

SATELLITES HELPING TO SOLVE DOWN-TO-EARTH CIVIL ENGINEERING PROBLEMS.
For primary bibliographic entry see Field 7B.
W76-07737

FLOOD PLAIN INFORMATION: NORTH FORK REPUBLICAN RIVER, WRAY, COLORADO.
Army Engineer District, Kansas City, Mo.
Prepared for the Colorado Water Conservation Board, June 1969. 29 p, 14 fig, 8 plates, 4 tab.

Descriptors: *Floods, *Flood profiles, Control structures, *Cloudbursts, *Flood plains, *Flash floods, Velocity, Flood flow, Peak discharge, Flood data, Historic floods, Flow duration, Channels, Dams, Reservoirs, Channel improvement, Levee, *Colorado.
Identifiers: *North Fork Republican River(Co), Wray(Co), Yuma County(Co), Chief Creek(Co), Intermediate regional flood, Standard project flood(Co).

Flood hazards along an 11 mile reach of the North Fork Republican River in the vicinity of Wray are evaluated. Although the total drainage area on the west edge of Wray is 1,216 square miles, only 59 sq. mi. actually contribute to surface runoff. Topographical barriers existing on the northern and southern edges of Wray have forced development expansion into the flood plain which has an average slope of 10 ft/mile and width of one-quarter mile. In 1934, Wray, a marketing center of 2,082 for the surrounding farming area, attempted to improve some of the bottom area for commercial development by straightening the river channel, building a levee, a diversion dam and a millrace. Business establishments are now located on both sides of the channel. Railroad tracks are also in the flood plain. Obstructions to floodflows include 10 bridges, highways, and railroads. Flooding from sidehill runoff in the town has been relieved since 1961 when the Soil Conservation Service completed a watershed treatment project which included six retarding dams. Flooding normally results from summer cloudbursts and is characterized by a very fast rate of rise and short durations. The Intermediate Regional Flood and the Standard Project Flood would have peak discharges of 4,200 and 11,700 cubic feet per second respectively, inundating the business area, railroad tracks and parts of U.S. Highway 34 and 385. Velocities vary markedly in the study reach. For an IRF channel velocities range from 2.59 to 6.89 ft/sec, overbank velocities from 0.93 to 2.33 ft/sec. Channel velocities for the SPF range from 3.63 to 7.95 ft/sec, overbank from 1.51 to 2.63 ft/sec. (Henley - North Carolina)
W76-07739

PREDICTING SNOWMELT RUNOFF USING A DETERMINISTIC WATERSHED MODEL WITH STOCHASTIC PRECIPITATION INPUTS,
Arizona Univ. Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2A.
W76-07764

FLOOD ESTIMATION FROM SHORT RECORDS,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia).
W. C. Boughton.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11996, p 241-253, March 1976. 5 fig, 7 tab, 9 ref.

Descriptors: *Flood forecasting, *Peak discharge, *Floods, Flood frequency, Hydraulics, Hydrology, Rainfall, Forecasting, Estimating, Watersheds(Basins), Streamflow, *Australia.
Identifiers: *Flood estimation, Short records, Queensland(Australia).

Peak flood flows are highly correlated with the daily flows in which they occurred, and this relationship was used to develop a method of extending short flood records. The frequency distribution of daily flows, estimated from daily rainfalls by a rainfall-runoff model, was used with the short flood record to estimate the long-term distribution of floods. Tests were made on 8 catchments, 67 sq mi to 505 sq mi in area in Queensland, Australia, using 10 years of streamflow record in each case with daily rainfalls to estimate 30 to 35 years of floods. Log-normal and Log-Pearson III distributions were fitted to both estimated and actual flood series. The estimated 1-in-50 year and 1-in-100 year floods differed on average by less than 8% from the actual records. (Roberts-ISWS)
W76-07771

APPLICATIONS OF REMOTE SENSING TO WATERSHED MANAGEMENT,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
A. Rango.
Available from the National Technical Information Service, Springfield, Va 22161, as N75 24072, $3.50 in paper copy, $2.25 in microfiche. NASA TM X-70896, April 1975. 15 p, 5 fig, 1 tab, 30 ref.

Descriptors: *Remote sensing, *Watershed management, *Water resources, Aerial photography, Satellites(Artificial), Aircraft, Floods, Floodplains, Snow cover, Runoff forecasting, Runoff, Land use, Watersheds(Basins), Physiographic provinces, Surface waters.

Present aircraft and satellite remote sensing systems (operational and experimental) are capable of contributing greatly to watershed management, primarily in the areas of snow mapping, surface water inventories, flood management, hydrologic land use monitoring, and watershed modeling. The two most widely applicable remote sensors are the Multispectral Scanner Subsystem on LANDSAT and the basic multispectral camera array flown on high altitude aircraft such as the U-2. Other aspects of watershed management will be investigated with future aircraft and spacecraft systems possessing higher resolutions and/or covering different spectral wavelength bands such as microwaves. The development of techniques for assessing soil moisture from remote sensing observations would provide a significant

breakthrough in hydrology. As the technological advances in remote sensing of hydrological data continue to accelerate, so must the watershed management community expand its awareness of and its training in remote sensing techniques if these new tools are to be put to optimum use. (Sims-ISWS)
W76-07791

THE WATER SUPPLY OF ROME,
College of Physicians of Philadelphia, Pa.
H. J. Abrahams.
Journal of American Water Works Association, Vol. 67, No. 12, p. 663-68 (1975). 6 p, 2 fig, 1 photo, 3 tab, 1 ref.

Descriptors: *History, *Water supply, *Water distribution(Applied), *Water management(Applied), *Water resources development, Water supply development, Water control, Water conveyance, Water sources, Surface water availability, Supply, Resources development, Piping systems(Mechanical), Pipelines, Pipe flow, Surface waters.
Identifiers: *Rome(Italy), Tiber River.

As ancient Rome began to grow in importance and size the demand for water increased beyond what could be taken from the Tiber River. Thus aqueducts were built to bring water into the city from the surrounding hills and streams. The water supply was propelled into the city by gravity but only one ninth of the aqueducts were upon arches. An aqueduct would discharge into a delivery tank in the city at its own elevation. The water was then conveyed by lead pipes to water basins and public buildings. Repairs upon the aqueducts generally took place in the fall and spring. Such repairs were usually greatly needed inasmuch as one half of the aqueducts' water often failed to arrive in Rome. The quality of the water arriving in the city was governed by many factors. Some aqueducts brought much purer waters into Rome than others. The quantity and quality of Rome's water supply depended greatly upon the quality of the water commissioners who guided construction and allotment of the water supply. The water delivery system stands as one of Rome's finest contributions to public health. (Welch-Florida)
W76-07819

FRAMEWORK AND RIVER BASIN STUDY PROGRAMS, LEVEL A AND LEVEL B STUDIES.
Corps of Engineers, Washington, D. C.
For primary bibliographic entry see Field 6E.
W76-07858

NAVIGATION OF RESTRICTED AREAS.
Corps of Engineers, Washington, D. C.
For primary bibliographic entry see Field 6E.
W76-07859

WATERSHED PROJECTS.
For primary bibliographic entry see Field 6E.
W76-07866

DREDGING ON THE MISSOURI RIVER OXBOW LAKES.
For primary bibliographic entry see Field 6E.
W76-07867

DYNAMICS OF THE ANNUAL GROWTH OF PINUS SYLVESTRIS L. IN THE TURGAI VALLEY IN CONNECTION WITH CLIMATIC FACTORS, (IN RUSSIAN),
Kustanai Pedigogical Institut (USSR).
For primary bibliographic entry see Field 2I.
W76-07984

POLLUTION OF THE RUNOFF IN SEPARATE SEWER SYSTEMS, AND MEASURES FOR THE REDUCTION OF RAINWATER RUNOFF-GENERATED POLLUTION OF WATER BODIES (DIE VERSCHMUTZUNG DES ABFLUSSES IM TRENNVERFAHREN SOWIE MASSNAHMEN ZUR VERMINDERUNG DER GEWAESSERVERSCHMUTZUNG INFOLGE REGENWASSEREINLEITUNGEN),
For primary bibliographic entry see Field 5B.
W76-07997

RUBBER ROOF PROTECTS WATER FROM POLLUTANTS.
For primary bibliographic entry see Field 5F.
W76-08003

POLLUTION OF WATER BODIES BY ARTIFICIAL RUNOFF OF RAINWATER POLLUTION BY WASTE WATER OF MIXED SEWERS (BELASTUNG DER GEWAESSER DURCH KUENSTLICHE ABLEITUNG VON NIEDERSCHLAEGEN. BELASTUNG DURCH ABWAESSER DER MISCHKANALISATION),
For primary bibliographic entry see Field 5B.
W76-08009

SYNTHETIC MONTHLY RUN-OFF RECORDS FOR UNGAUGED BRITISH CATCHMENTS,
Northumbrian River Authority, Gosforth (England).
B. M. J. Barton.
Journal of the Institution of Water Engineers, Vol. 27, No. 3, p 149-162, May, 1973. 3 fig, 3 tab. 12 ref.

Descriptors: *Model studies, *Runoff, Computer programs, Topography, Soil types, Geology, Gaging, Snow, Rainfall-runoff relationships, Data collections.
Identifiers: Catchment records.

A technique whereby a synthetic record of monthly runoff may be generated for any British catchment, gaged or ungaged, has been developed. The technique involves the simultaneous stochastic generation from readily available data of monthly values of catchment precipitation, potential transpiration, and snowlag, which are then routed through a simple deterministic catchment model to yield the corresponding synthetic record of monthly runoff. Numerical values of the model parameters are obtained from a correlation with the topography, geology, and soil type of the catchment under investigation. The technique is intended primarily for use with high-speed electronic computers. A computer program incorporating both deterministic model and stochastic data generation procedures is used, enabling a semi-infinite synthetic catchment runoff record to be obtained. (Sandoski-FIRL)
W76-08010

STORM DRAINAGE 'FILTERED' BEFORE DISCHARGE,
For primary bibliographic entry see Field 5G.
W76-08032

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 9 AND 10. COLORADO RIVER BASIN AND THE GREAT BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-08045

HYDRAULIC EFFECTS OF CHANGES IN BOTTOM-LAND VEGETATION ON THREE MAJOR FLOODS, GILA RIVER IN SOUTHEASTERN ARIZONA,
Geological Survey, Sacramento.
For primary bibliographic entry see Field 4C.
W76-08050

SURFACE-WATER RESOURCES OF THE TANGIPAHOA, TCHEFUNCTA, AND NATALBANY RIVER BASINS, SOUTHEASTERN LOUISIANA,
Geological Survey, Baton Rouge, La.
L. D. Fayard, and D. J. Nyman.
Louisiana Department of Public Works, Baton Rouge, Water Resources Technical Report No 11, 1976. 49 p, 12 fig, 6 plates, 5 tab, 26 ref.

Descriptors: *Water resources, *Surface waters, *Water quality, *Hydrologic data, *Louisiana, Streamflow, Water yield, Base flow, Low flow, Inflow, Groundwater movement, Chemical analysis, Data collections, Available water.
Identifiers: *Tangipahoa River basin(La), *Tchefuncta River basin(La), *Natalbany River basin(La).

The Tangipahoa, Tchefuncta, and Natalbany River basins are in southeastern Louisiana, north of Lakes Maurepas and Pontchartrain. The combined average flow of the rivers is about 1,400 cfs, or 900 mgd. Rivers in the Tangipahoa and Tchefuncta basins have very good connection with the shallow aquifers and, therefore, have high sustained yields during periods of base flow. The lowest flow recorded in Tangipahoa River at Robert (1938-74) was 245 cfs, which is equivalent to a basin yield of 0.38 cubic foot per second per square mile of drainage area. The lowest flow recorded in Tchefuncta River near Folsom (1943-74) was 26 cfs, equivalent to 0.27 cubic foot per second per square mile. The quality of the water in both rivers is good, and dissolved solids are generally less than 50 mg/litre. These two rivers are good potential sources for municipal and industrial water supplies. Fecal coliform bacteria in undesirable amounts (greater than 200 colonies per 100 milliliters) have been detected in the two rivers, indicating periodic pollution by bacterial wastes. Streams in the Natalbany basin are poorly connected to the shallow aquifer. A 1-day low flow of 1.8 cfs (1943-74), equivalent to 0.023 cubic foot per second per square mile of drainage area was recorded at Baptist. Large withdrawals from these streams would not be feasible because of the large amount of storage that would be required. The water is slightly more mineralized than water from the other basins but is generally of good quality. (Woodard-USGS)
W76-08056

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1975,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W76-08057

HYDROLOGY OF THE NORTH CASCADES REGION, WASHINGTON: 1. RUNOFF, PRECIPITATION, AND STORAGE CHARACTERISTICS,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2A.
W76-08059

HYDROLOGY OF THE NORTH CASCADES REGION, WASHINGTON: 2. A PROPOSED HYDROMETEOROLOGICAL STREAMFLOW PREDICTION METHOD,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2A.
W76-08060

STUDIES ON THE OPERATION OF GOBIND-SAGAR RESERVOIR,
Regional Engineering Coll., Kurukshetra (India).
N. N. Pillai, and G. S. Sodhi.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 1, p 19-28, January 1975. 2 fig, 3 tab, 9 ref.

Descriptors: *Reservoir operation, *Irrigation, *Power, *Water supply, Hydrologic data, Reser-

voir storage, Reservoir releases, Farmers, Industries, *Risks.
Identifiers: *Gobindsagar reservoir(India), Depletion period.

Bhakra Nangal Project has irrigation and power generation as the main objectives. Water released for irrigation is utilized in generation of power also. But since the irrigation requirements vary considerably and in some years there has developed acute shortage of water in the reservoir, drastic power cuts are imposed affecting the consumers adversely. It is suggested that the releases from Gobindsagar reservoir may be made so that the shortages are distributed throughout the depletion period. Based on the reservoir elevation reached at any time and the inflows expected in future, a graphical procedure is developed to calculate reservoir factors at the beginning of each tenday period. This procedure will insure high firm power with the constraints of irrigation requirements. Also, early information can be given to the farmers and industrialists concerning the probable amount of water release and power generation in order to avoid uncertain risks. (Bell-Cornell)
W76-08068

A STUDY OF MAJOR RAIN STORMS OVER AND NEAR MAHI BASIN UP TO KADANA DAM SITE FOR THE EVALUATION OF PROBABLE MAXIMUM DESIGN STORM,
Institute of Tropical Meteorology, Poona (India).
For primary bibliographic entry see Field 2B.
W76-08069

APPLICATION OF LINEAR PROGRAMMING OPTIMIZATION TO A NORTHERN ONTARIO HYDRO POWER SYSTEM,
Environment Canada, Ottawa, Ontario, Water Planning and Management Branch.
D. W. Draper, and K. Adamowski.
Canadian Journal of Civil Engineering, Vol. 3, No. 1, p20-31, March 1976. 7 fig, 1 tab, 7 ref.

Descriptors: *Reservoir storage, *Linear programming, *Hydroelectric power, *Comprehensive planning, Optimization, Regulation, Discharge(Water), Operations research, Simulation analysis, Computer programs, Streamflow, Costs, Constraints, Equations, Mathematical models, Systems analysis, Canada, Screening.
Identifiers: Allocation.

A linear programming technique is used as an aid in selecting storage reservoirs for a hydroelectric power development system at the feasibility stage of investigation, and for maximizing system guaranteed hydroelectric power by optimum regulation of discharge through power plants and from diversions for a selected time period. The linear programming technique is used as an allocation or screening model that provides information on system operation and response which would be useful in the preliminary design of hydroelectric power producing facilities and from which basic data and guidelines could be extracted for extending the investigation to the study of long-term system response by use of simulation models. The linear programming model has proved effective as a screening or allocation tool in the first phase of a modeling study conducted on one possible system for developing hydropower on the Albany River in Northern Ontario. The model lends itself to the type of application described, particularly if constraint and production functions can be linearized without introducing major complications in determining the matrix coefficients or large inaccuracies in the solutions. (Bell-Cornell)
W76-08074

DESIGN FLOOD SYNTHESIS BY EXCESS RAIN ROUTING,
Witwatersrand, Johannesburg, Africa, Department of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-08075

FLOOD PEAK ESTIMATES FROM SMALL RURAL WATERSHEDS,
Federal Highway Administration, Washington, D. C.
For primary bibliographic entry see Field 2A.
W76-08077

A REALISTIC APPROACH TO RIVER BASIN DEVELOPMENT,
International Water Resources Association, New Delhi, India.
K. L. Rao.
Working Paper No. 47, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 25 p, 2 fig, 1 tab.

Descriptors: *River basin development, *Planning, Irrigation, Water demand, Water supply, Flood control, Water balance, Water utilization, Soils, Optimum development plans.
Identifiers: *India, *Developing countries, Food production, National water links, Economic restraints, Technical restraints.

River basin development leads to the development of the useful land regions of the world. The characteristics of river basins vary greatly from one another. In India, there are 14 major river basins, each exceeding 20,000 sq. km.; three of these are Himalayan rivers and the rest Peninsular rivers. There are 44 medium river basins and numerous rivers with smaller catchments. Major river basins constitute 83% of the geographical area of the country. This paper considers the planning needs for the major rivers in India. Three rivers, the Indus, the Ganga, and the Brahmaputra account for more than 50% of the total drainage area of the major rivers. Due to their size, it will be necessary to treat each important tributary of these large rivers as a subbasin on its own merits. Thus, the number of subbasins to be considered in the Indus, the Ganga, and the Brahmaputra will total up to about 140. It will be desirable to divide the basins into regions of approximately 10,000 sq. km., each bounded by tributary rivers, in order to accomplish a detailed assessment of water needs and planning. (Bell-Cornell)
W76-08081

INTEGRATED DEVELOPMENT OF THE VARDAR/AXIOS RIVER BASIN,
United Nations, New York, N.Y.
P. G. D. Shallow.
Working Paper No. 63, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 9 p.

Descriptors: *United Nations, *River basin development, Projects, *Water resources development, Governments, Regulation, History, Multiple-purpose, Watersheds(Basins), Coordination, Planning, Reservoirs, Costs, Irrigation, Systems analysis.
Identifiers: *Greece, *Yugoslavia, *Vardar/Axios River basin.

This paper is concerned with the implementation of an on-going project of the United Nations Development Programme in which the United Nations is assisting the Governments of Greece and Yugoslavia to prepare a phased program for the regulation and utilization of the water resources of a common river basin. It traces the history of the project and describes the characteristics of the basin. Details are given of the institutional framework under which the work is being undertaken, the progress of the studies to date, the future inputs of the United Nations, and the means being employed to insure coordination of the works at the project level. (Bell-Cornell)
W76-08082

AGGREGATE MODELING OF WATER DEMANDS FOR DEVELOPING COUNTRIES UTILIZING SOCIO-ECONOMIC GROWTH PATTERNS,
Oklahoma University, Norman, Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 6D.
W76-08083

SIZING FLOOD CONTROL RESERVOIR SYSTEMS BY SYSTEMS ANALYSIS,
Hydrologic Engineering Center, Davis, Calif.
B. Eichert, and D. Davis.
Technical Paper No. 44, March 1976. 32 p, 1 fig, 3 tab.

Descriptors: *Flood control, *Reservoirs, *Size, *Computer programs, Systems analysis, Simulation analysis, Planning, Operation and maintenance, Reservoir storage, Costs, Hydrology, Economics, Effects, Mathematical models.
Identifiers: Sensitivity analysis.

This paper focuses upon reservoirs as flood control measures. Planning flood control reservoir systems requires analysis of basin-wide hydrology, individual reservoir and system operation, and system performance in reducing intensity of flooding. Sizing reservoir systems includes the major tasks of selecting system components from among competing alternatives and determining the flood control storage within each reservoir. Due to the large number of alternative systems possible in complex river basins and because of the complexity of evaluating each system, it is essential that a reasonably structured system formulation strategy be adopted as the framework for analysis. Application of a practical flood control reservoir system simulation model that yields detailed system operation of all components and summarizes hydrologic and economic performance and costs greatly assists in determining system performance. To perform the simulation, the model accepts data on (1) historical or synthetic flood hydrology, (2) reservoir system storage and operating criteria, (3) reservoir costs, and (4) damage potential at system control points. Discussed is the scope of reservoir system formulation, modeling flood control systems, criteria and strategies for system formulation; the concepts are illustrated with applications in recent systems studies. (Bell-Cornell)
W76-08085

STORM DRAINAGE AND URBAN REGION FLOOD CONTROL PLANNING,
Hydrologic Engineering Center, Davis, Calif.
D. Davis.
Technical Paper No. 40, October 1974. 44 ref.

Descriptors: *Storm water, *Management, *Storm drains, *Planning, *Flood control, Urban hydrology, Rainfall-runoff relationships, Urbanization, Effects, Watersheds(Basins), Analytical techniques, Performance, Design storm, Costs, Flood plains.
Identifiers: Alternatives, Public participation.

Stormwater management systems are expensive and have performed well in some instances and poorly in others. The investment in storm drains is three times the investment in works to protect the flood plain, and the annual damages from inadequate storm drains may well exceed the damage inflicted upon urban flood plains. Storm drainage systems are a major planning task because of the large variety of management alternatives that are possible and because the impact of works on communities can be very great. Competition for space and funds and good planning require that drainage systems be considered integral parts of a broader urban design and that advantage be taken of all feasible joint development opportunities. In addition, there is growing concern that many problems should be amenable to nonstructural solutions that do not necessarily require large scale disturbance of the landscape. This paper (1) defines the subject area and describes its characteristics, (2) reviews past concepts in storm

drainage, (3) describes the current context of planning these systems (4) describes the alternatives available and the implementation requirements, and (5) discusses institutional factors including the federal interest, and concludes with some observations on current planning approaches. (Bell-Cornell)
W76-08086

PLANNING FOR THE REHABILITATION OF GRAVEL PITS,
Waterloo University, Ontario, Canada, School of Urban and Regional Planning.
G. Mulamoottil, and R. Farvolden.
Water Resources Bulletin, Vol. 11, No. 3, p 599-604, June 1975. 2 fig, 5 ref.

Descriptors: *Planning, *Recreation, *Lakes, Surface waters, Groundwater, Soils, Land use, Topography, Canada.
Identifiers: *Gravel pits, *Urban areas.

By field investigations and planning, it is profitable to rehabilitate gravel pits as recreational lakes in urban areas. Some of the important aspects to be considered are topography, soil, surface water and groundwater. A case study is presented and some general guidelines in the rehabilitation process are given. This kind of a use for derelict land is important at the present time as there is a growing demand for recreational lakes in urban areas. (Bell-Cornell)
W76-08087

METHODOLOGY FOR THE SELECTION AND TIMING OF WATER RESOURCES PROJECTS TO PROMOTE NATIONAL ECONOMIC DEVELOPMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-08091

OPTIMAL SIZING OF URBAN FLOOD CONTROL SYSTEMS,
Hydrologic Engineering Center, Davis, Calif.
D. W. Davis.
Technical Paper No. 42, March 1974. 16 p, 5 fig, 1 tab, 9 ref.

Descriptors: *Flood control, *Water resources, *Simulation analysis, *Computer models, *Urbanization, Planning, Hydrology, Size, *Optimization, Methodology, Drainage, Costs, Reservoirs, Storage, Pumping plants, Diversion, Rainfall-runoff relationships, Equations, Mathematical models, Systems analysis.
Identifiers: Economic analysis, Benefit maximization, Social costs, Minimization, Automatic search procedure, Univariate gradient procedure, Newton-Raphson convergence procedure, Systems engineering.

Optimal sizes for components of urban flood-control systems can be determined from a detailed simulation analysis controlled by an optimization methodology. Flood-control measures within urban areas frequently consist of complex systems of detention storage reservoirs, channel modifications, levees, land-use controls, flood proofing, and pumping facilities. The optimal size of each of these system components depends on the system interaction with other components and the hydrologic, economic, environmental, and other performance outputs of the system. A technique has been developed and programmed for an existing simulation model that automatically determines the sizes of urban flood-control components of detention storage, flow diversions, and pumping plants, the objective being to maximize system net benefits subject to accomplishment of hydrologic performance targets and to minimize social costs. The system is simulated using hydrologic data, component cost and performance functions, and flow damage information at damage centers. Utilized also are an automatic search procedure--the univariate gradient procedure--and the Newton-Raphson convergence procedure. (Bell-Cornell)
W76-08092

THE USE OF OVERWINTER DRAW DOWN FOR AQUATIC VEGETATION MANAGEMENT,
Wisconsin Univ. Extension, Madison. Environmental Resources Unit.
For primary bibliographic entry see Field 2I.
W76-08093

PROBLEMS IN FORECASTING WATER REQUIREMENTS,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 6D.
W76-08098

A SIMULATION MODEL FOR OPERATING A MULTIPURPOSE MULTIRESERVOIR SYSTEM,
Acres Consulting Services Ltd., Niagara Falls (Ontario).
O. T. Sigvaldason.
Water Resources Research, Vol. 12, No. 2, p 263-278, April 1976. 8 fig, 3 tab, 40 ref.

Descriptors: *Multiple-purpose reservoirs, *Reservoir operation, *Simulation analysis, *Optimum development plans, Water policy, Assessment, River basins, Reservoir storage, Networks, Equations, Mathematical models, Systems analysis, *Canada.
Identifiers: *Trent River basin(Ontario Canada), Out-of-kilter algorithms.

Described is a simulation model used for assessing alternative operating policies for the Trent River system in Ontario, Canada. The Trent basin has numerous reservoirs (48 were represented in the model). The reservoir system is used for flood control, water supply, hydropower, and augmenting flows through the canal system during the summer period. The need for assessing alternative policies arose from growing conflicts in recent years over satisfying all of the many water-based needs of the basin. The simulation model aided in assessing the impact of alternative policies. Every reservoir was subdivided into five storage zones (variable temporally). A time-based rule curve was prescribed to represent ideal reservoir operation. Ranges were prescribed for channel flows, which were dependent on water-based needs. The underlying concept of the model was the mathematical representation of the chief operator's perception of 'optimum' operation and the derivation of this solution using a nested optimization submodel. 'Penalty coefficients' were assigned to those variables which represented deviations from ideal conditions. Different operational policies were simulated by representing the entire reservoir system in 'capacitated network' form and deriving optimum solutions for individual time periods with the 'out-of-kilter' algorithm. The algorithm was computationally efficient, simplified model development, and permitted flexibility in readily using the model for a wide range of reservoir configurations and operating policies. (Bell-Cornell)
W76-08099

THE DEVELOPMENT OF WATER MULTIPLIER IMPACTS FROM INPUT-OUTPUT ANALYSIS: AN EMPIRICAL EXAMPLE FROM BOULDER, LARIMER, AND WELD COUNTIES, COLORADO,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 6D.
W76-08100

4B. Groundwater Management

CLAM SURVIVAL IN CHLORINATED WATER,
Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
For primary bibliographic entry see Field 5G.
W76-07481

A SIMPLIFIED APPROACH FOR THE ANALYSIS OF UNSTEADY FLOW TO A CAVITY WELL,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
For primary bibliographic entry see Field 2F.
W76-07561

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, 1975--A BASIC-DATA REPORT,
Geological Survey, Albuquerque, N. Mex.
R. R. Cruz.
Open-file report, March 1976. 39 p, 9 fig, 5 tab, 2 ref.

Descriptors: *Water wells, *Withdrawal, *Water level fluctuations, *Water quality, *New Mexico, Military reservations, Water supply, Basic data collections, Hydrology, Drawdown, Groundwater recharge, Chemical analysis, Aquifers.
Identifiers: *White Sands Missile Range (N Mex).

This report presents water-resources information that was collected at White Sands Missile Range, N. Mex., during 1975 by personnel of the U.S. Geological Survey. Data on groundwater pumpage and resulting water-level fluctuation, chemical quality, and precipitation are summarized. The data are part of the continuing water-resources basic-data collection program sponsored by the Facilities Engineering Directorate, White Sands Missile Range. Groundwater pumpage totaled 714,580,000 gallons (preliminary figures) at the Post Headquarters well field in 1975. This was 42,646,000 gallons less than pumpage in 1974. Water-levels declined in six of the nine supply wells in the Post Headquarters well field during the period of December 1974 to December 1975. The declines ranged from 21.00 feet to less than one foot. The annual total rainfall was 9.12 inches, which is 1.61 inches below the yearly average. There was no significant change in water quality for samples collected during 1975 compared with 1974 samples. (Woodard-USGS)
W76-07588

AVAILABILITY OF GROUND WATER IN THE PEMIGEWASSET AND WINNIPESAUKEE RIVER BASINS, CENTRAL NEW HAMPSHIRE,
Geological Survey, Concord, N. H.
For primary bibliographic entry see Field 7C.
W76-07589

RECONNAISSANCE OF THE WATER RESOURCES OF THE UPPER KLICKITAT RIVER BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4A.
W76-07594

PRELIMINARY REPORT ON WATER AVAILABILITY IN THE LOWER SHIP CREEK BASIN, ANCHORAGE, ALASKA--WITH SPECIAL REFERENCE TO THE FISH HATCHERY ON FORT RICHARDSON AND A PROPOSED FISH-HATCHERY SITE NEAR THE ELMENDORF AIR FORCE BASE POWERPLANT,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 8I.
W76-07595

WATER RESOURCES OF PIERCE COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Conservation Co and Div.
For primary bibliographic entry see Field 4A.
W76-07598

AQUIFER TESTS IN THE SUMMIT REACH OF THE PROPOSED CROSS-FLORIDA BARGE CANAL NEAR OCALA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W76-07599

WATER-RESOURCES RECONNAISSANCE OF ST. GEORGE ISLAND, PRIBILOF ISLANDS, ALASKA.
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W76-07601

GEOHYDROLOGY OF THE LAKE AREA AT KATHRYN ABBEY HANNA PARK, JACKSONVILLE, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W76-07602

SPRINGS OF PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 2F.
W76-07604

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, MAY 1974,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5A.
W76-07606

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, AUGUST 1974, AND CHEMICAL MONITORING FROM JULY 1972 TO JUNE 1974,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5A.
W76-07607

PROBLEMS RELATED TO THE RENEWED GROUNDWATER LEVEL RISE IN PREVIOUS MINING AREAS AS ILLUSTRATED BY THE SOUTHERN LUSATIA EXAMPLE (PROBLEME DES GRUNDWASSERWIEDERANSTIEGS IN EHEMRLIGEN BERGBAUGEBIETEN AM BEISPIEL DER SUED-LAUSITZ),
For primary bibliographic entry see Field 5B.
W76-07663

APPLICATION OF THE WINTERS DOCTRINE: QUANTIFICATION OF THE MADISON FORMATION,
For primary bibliographic entry see Field 6E.
W76-07808

HEAVY METALS AS TRACE CONSTITUENTS IN NATURAL GROUNDWATERS AND POLLUTED,
Kiel Univ. (West Germany). Geologish-Palaeontologisches Institut und Museum.
For primary bibliographic entry see Field 5A.
W76-07978

GEOLOGY AND GROUND-WATER RESOURCES OF HETTINGER AND STARK COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
H. Trapp, Jr., and M. G. Croft.
North Dakota State Water Commission, Bismarck, County Ground-Water Studies 16--Part I, 1975. 51 p, 14 fig, 4 plates, 4 tab, 52 ref.

Descriptors: *Groundwater resources, *Water quality, *Aquifer characteristics, *Hydrogeology, *North Dakota, Hydrologic data, Water yield, Water utilization, Maps, Water wells, Water level fluctuations, Chemical properties, Available water, Geology.
Identifiers: Hettinger County(N Dak), Stark County(N Dak).

The sedimentary rocks of Paleozoic, Mesozoic, and Cenozoic age in Hettinger and Stark Counties, N. Dak., on the south-central flank of the Williston structural basin, are about 14,000 feet thick. They are gently folded into north-plunging anticlines and synclines. The Fox Hills and basal Hell Creek aquifer system underlies the entire area at depths greater than 1,100 feet. The water in this system is a sodium bicarbonate type with a dissolved-solids concentration of 1,310 to 1,540 mg/litre. The upper Hell Creek and lower Cannonball-Ludlow aquifer system underlies all of Hettinger and Stark Counties. The water contains a sodium bicarbonate type with a dissolved-solids concentration ranging from 1,450 to 1,890 mg/litre. Water in the basal sandstone member is generally a sodium bicarbonate type with a dissolved-solids concentration ranging from 704 to 1,470 mg/litre. The Sentinel Butte aquifer system underlies most of Stark County. The water is generally of a sodium sulfate type. Dissolved-solids concentration of the samples ranged from 378 to 11,700 mg/litre. Approximately 6,800 acre-ft of water was obtained from groundwater and surface-water sources in 1969. Groundwater sources furnished about 40 percent of the total water supply. (Woodard-USGS)
W76-08043

KARST AND PALEOHYDROLOGY OF CARBONATE ROCK TERRANES IN SEMIARID AND ARID REGIONS WITH A COMPARISON TO HUMID KARST OF ALABAMA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-08044

ARTIFICIAL RECHARGE THROUGH A WELL IN FISSURED CARBONATE ROCK, WEST ST. PAUL, MINNESOTA,
Geological Survey, St. Paul, Minn.
H. O. Reeder, W. W. Wood, G. G. Ehrlich, and R. J. Sun.
Available from Supt. of Documents, GPO, Wash., D.C. 20402, price $1.65. Water-Supply Paper 2004, 1976. 80 p, 28 fig, 16 tab, 55 ref.

Descriptors: *Artificial recharge, *Injection wells, *Aquifer characteristics, *Aquifer testing, *Minnesota, Carbonate rocks, Methodology, Observation wells, Feasibility studies, Groundwater recharge, Underground storage, Hydrogeology, Water yield, Water level fluctuations, Groundwater movement, Tracking techniques.
Identifiers: *West St. Paul(Minn), Prairie du Chien Group, Jordan Sandstone.

Tests were made near St. Paul, Minn., to determine the feasibility of artificially recharging a consolidated aquifer by well injection. The formations of primary concern at the recharge experiment site are the Prairie du Chien Group and the underlying Jordan Sandstone, which is the major aquifer in the area. The Prairie du Chien is made up primarily of well-fractured dolomite, which contains solution openings. The Jordan Sandstone is more uniform and is considered to be homogeneous on a large scale, although small fractures and variations in material are recognized locally. The two layers are hydraulically interconnected and are artesian. A head difference of 2 ft is noted between water levels in a well open only in the dolomite and in a nearby well open only in the sandstone. For the tests, a production well was installed in the Prairie du Chien Group, and observation wells were installed nearby, both in the Prairie du Chien and in the Jordan Sandstone. Pumping tests were performed before and after injection, and the injection test itself involved recharge of 2,754,000 gallons occurring at a rate of about 100 gpm for 20 days. Air entrainment during injection was avoided by use of a small-diameter pipe, in which pipe friction was sufficient to maintain positive pressure throughout the column. The injection test demonstrated that it is hydrologically feasible to recharge the Prairie du Chien Group and the Jordan Sandstone artificially through wells completed in the Prairie du Chien Group. (Woodard-USGS)
W76-08046

EVALUATION OF GROUND-WATER CONTAMINATION FROM CLEANING EXPLOSIVE-PROJECTILE CASINGS AT THE BANGOR ANNEX, KITSAP COUNTY, WASHINGTON, PHASE II,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 5B.
W76-08048

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--TEXAS-GULF REGION,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2F.
W76-08051

GEOHYDROLOGIC RECONNAISSANCE OF THE IMPERIAL VALLEY, CALIFORNIA,
Geological Survey, Reston, Va.
O. J. Loeltz, B. Irelan, J. H. Robison, and F. H. Olmsted.
Available from Superintendent of Documents, Government Printing Office, Washington, D. C., 20402, $2.85 in paper copy. Professional Paper 486-K, 1975. 54 p, 12 fig, 2 plates, 5 tab, 53 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Well data, *Water quality, *Deserts, California, Projecting, Water demand, Irrigation, Data collections, Hydrogeology, Groundwater potential, Chemical analysis.
Identifiers: *Imperial Valley(Calif).

The Imperial Valley in southern California is the largest desert irrigation development in the United States. Half a million acres of otherwise parched desert lands have been transformed into one of the most productive agricultural areas in the Nation by the importation of Colorado River water. Recognizing that the ever increasing demands for Colorado River water might exceed the available supply, the objectives of this report on Imperial Valley were (1) to describe the geology in relation to the occurrence of groundwater, (2) to define the hydraulic characteristics (transmissivity and storage) of the aquifers, (3) to determine the sources of groundwater, (4) to determine the direction of movement of groundwater, (5) to determine the principal means by which groundwater is discharged, (6) to determine the chemical quality of the groundwater in various parts of the system, and (7) to relate differences in chemical composition of the water to differences in the sources of recharge and to man-caused and natural processes. More than 300 wells were inventoried. (Woodard-USGS)
W76-08052

AVAILABILITY OF GROUND WATER FOR IRRIGATION ON THE KEKAHAMANA COASTAL PLAIN, ISLAND OF KAUAI, HAWAII,
Geological Survey, Honolulu, Hawaii.
R. J. Burt.
Hawaii Division of Water and Land Development, Honolulu, Report R-53, January 1976. 79 p, 14 fig, 3 tab, 13 ref.

Descriptors: *Groundwater resources, *Irrigation, *Sugarcane, *Hawaii, *Hydrologic data, Hydrogeology, Irrigation wells, Aquifer characteristics, Withdrawal, Water yield, Artesian heads, Drawdown, Saline water intrusion, Sea water, Groundwater recharge, Evaluation.
Identifiers: *Kauai(Hawaii).

The Kekaha-Mana coastal plain on the southwest side of the island of Kauai, Hawaii is underlain by a basaltic aquifer from which individual wells or shafts yield as much as 22 mgd. The basaltic aquifer is recharged in a highland area adjacent to the plain and is overlain by about 200 feet of poorly permeable sedimentary formations that retard natural discharge, creating artesian conditions. Pumpage from wells and shafts tapping the basaltic aquifer for irrigation of sugarcane began in the early 1900's. This development of groundwater has been accompanied by an increasing chloride content of water from the basalt, reflecting seawater intrusion as artesian heads declined. Average pumpage for 1958-68 was about 24 mgd (27,000 acre-ft annually); pumpage in both 1972 and 1973 was about 73 mgd (82,000 acre-ft), tripling the former average. At this rate, pumpage exceeds recharge by tens of thousands of acre-feet each year. (Woodard-USGS)
W76-08054

RECORDS OF WELLS, SPRINGS, AND STREAMS IN THE POTOMAC RIVER BASIN, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va.
E. A. Friel, W. A. Hobba, Jr., and J. L. Chisholm.
West Virginia Geological and Economic Survey, (Morgantown), Basic Data Report No 3, 1975. 96 p, 3 fig, 10 tab.

Descriptors: *Hydrologic data, *Potomac River, *West Virginia, *Water resources, *Water quality, River basins, Streamflow, Flow rates, Gaging stations, Basic data collections, Surface waters, Groundwater, Aquifer characteristics, Well data, Drillers logs, Water analysis, Chemical analysis, Pesticides.
Identifiers: *Potomac River Basin(W Va).

This basic data report was compiled from water-resources studies of the Potomac River basin in West Virginia. Most of the basic data were obtained during the period 1968-1971. The study is a part of the continuing investigation of the water resources of the river basins of West Virginia by the U. S. Geological Survey, conducted in cooperation with the West Virginia Geological and Economic Survey and the West Virginia Department of Natural Resouces, Division of Water Resources. Other included data are from the files of the U. S. Geological Survey or from previously published reports. The 10 tables of data include: (1) records of wells and springs, (2) chemical analyses of groundwater, (3) chemical analyses of surface water, (4) field chemical analyses of surface water at stream-gaging stations, (5) low-flow measurements and field chemical analyses of selected streams and springs, (6) daily specific conductance and discharge of Dillions Run at Capon Bridge, (7) pesticide analyses of groundwater, (8) standard summaries of streamflow data, (9) discharge measurements at partial-record and miscellaneous sites, and (10) selected drillers' logs. (Woodard-USGS)
W76-08055

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1975,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W76-08057

GEOHYDROLOGIC SIGNIFICANE OF LITHOFACIES OF THE CARRIZO SAND OF ARKANSAS, LOUISIANA, AND TEXAS AND THE MERIDIAN SAND OF MISSISSIPPI,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 2F.
W76-08061

4C. Effects On Water Of Man's Non-Water Activities

THE PLIGHT OF THE URBAN RESERVOIR: A CASE STUDY,
Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W76-07452

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 17-3, LONGSHORE WAVE ENERGY ANALYSES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07470

PROCEEDINGS: LAKE TAHOE RESEARCH SEMINAR II, 27 SEPTEMBER 1974, SANDS VAGABOND CONVENTION CENTER, SOUTH LAKE TAHOE, CALIFORNIA,
Lake Tahoe Area Research Coordination Board South Lake Tahoe, Calif.
For primary bibliographic entry see Field 5G.
W76-07793

CONIFER DAMAGE AND DEATH ASSOCIATED WITH THE USE OF HIGHWAY DEICING SALT IN THE LAKE TAHOE BASIN OF CALIFORNIA AND NEVADA,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
For primary bibliographic entry see Field 5C.
W76-07796

PUBLIC RIGHTS IN GEORGIA'S TIDELANDS,
Georgia Univ., Athens. Inst. of Government.
For primary bibliographic entry see Field 6E.
W76-07824

HYDRAULIC EFFECTS OF CHANGES IN BOTTOM-LAND VEGETATION ON THREE MAJOR FLOODS, GILA RIVER IN SOUTHEASTERN ARIZONA,
Geological Survey, Sacramento.
D. E. Burkham.
Available from Supt. of Documents, GPO, Wash., DC 20402, price $2.05. Professional Paper 655-J, 1976. 14 p, 2 fig, 2 plates, 2 tab, 12 ref.

Descriptors: *Vegetation effects, *Floods, *Runoff, *Arizona, Streamflow, Hydrologic data, Flow rates, Depth, Channel morphology, Peak discharge, Roughness coefficient, Water yield, Evaluation.
Identifiers: *Gila River(Ariz).

Changes in bottom-land vegetation between December 1965 and October 1972 caused significant differences in stage, mean cross-sectional velocity, mean cross-sectional depth, and boundary roughness at peak discharges of three major floods in an 11.5-mile study reach of the Gila River in southeastern Arizona. The first flood, which had a peak flow of 39,000 cfs, occurred in December 1965 when the dense bottom-land vegetation was dormant. The second flood, which had a peak discharge of 40,000 cfs, occurred in August 1967 when the vegetation had large amounts of foliage; however, the vegetation had been eradicated in the upstream half of the study reach prior to this flood. The third flood, which had a peak discharge of 80,000 cfs, occurred in October 1972; the vegetation had been eradicated in the whole study reach prior to this flood. Compared to the 1965 flood, the large amounts of foliage in the uncleared half of the reach during the 1967 flood apparently caused a 7 percent decrease in mean velocity, a 6 percent increase in mean depth, and an 11 percent increase in the Manning roughness coefficient at peak stage. Compared to the 1965 flood the clearing of the study reach apparently caused a 25 percent increase in mean velocity, a 15 percent decrease in mean depth, and a 30 percent decrease in the Manning roughness coefficient at peak stage in the 1967 and 1972 floods. (Woodard-USGS)
W76-08050

4D. Watershed Protection

VARIATION IN EVAPORATIVE POWER ON SLOPES OF DIFFERENT EXPOSURE AND STEEPNESS IN THE USSR,
For primary bibliographic entry see Field 2D.
W76-07554

EXTRACTION AND UTILIZATION OF SPACE ACQUIRED PHYSIOGRAPHIC DATA FOR WATER RESOURCES DEVELOPMENT,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
A. Rango, J. Foster, and V. V. Salomonson.
Available from the National Technical Information Service, Springfield, Va., 22161, as N75 17767, $4.00 in paper copy, $2.25 in microfiche. NASA TM X-70827, January 1975. 28 p, 1 fig, 3 tab, 7 ref.

Descriptors: Watershed management, *Remote sensing, *Satellites(Artificial), *Watersheds(Basins), *Drainage area, Physiographic provinces, Drainage patterns(Geologic), Drainage, Geomorphology, Geology, Land use, Drainage density, Runoff, Runoff forecasting, Water resources.
Identifiers: *ERTS.

ERTS-1 satellite imagery has been evaluated as a means of providing useful watershed physiography information. From these data, physiographic parameters (such as drainage basin area and shape, drainage density, stream length and sinuosity, and the percentage of a watershed occupied by major land use types) were obtained in three study areas: (1) southwestern Wisconsin, (2) eastern Colorado, and (3) portions of the Middle Atlantic States. Using ERTS-1 imagery at 1:250,000 and 1:100,000 scales, it was found that drainage basin area and shape and stream sinuosity were comparable (within 10%) in all study areas to physiographic measurements derived from conventional topographic maps at the same scales. Land use information can be usefully extracted for watersheds as small as 30 sq mi. Improved drainage network and density information was obtained from ERTS-1 imagery in dissected areas such as southwestern Wisconsin, but in heavily vegetated areas (Middle Atlantic States) or areas with little physical relief (Eastern Colorado) low order streams are difficult to detect and the derived drainage densities are significantly smaller than those obtainable from standard maps. It was concluded that ERTS-1 imagery can be employed to advantage in mean annual runoff prediction techniques and in providing or maintaining land use information used in the calibration and operation of watershed models. (Sims-ISWS)
W76-07566

ENVIRONMENTAL ASPECTS OF RUN-OFF AND SILTATION IN THE ANACOSTIA BASIN FROM HYPERALTITUDE PHOTOGRAPHS,
Maryland Univ., College Park.
C. D. Ealy, R. F. Mueller, and J. R. Weidner.
Available from the National Technical Information Service, Springfield, Va., 22161, as N75

24067, $3.50 in paper copy, $2.25 in microfiche. NASA TM X-70888, November 1973. 43 p, 9 fig, 16 tab, 19 ref.

Descriptors: *Remote sensing, *Runoff, *Silting, Aerial photography, Satellites(Artificial), Environment, Environmental effects, Soils, Water pollution, Urbanization, Construction, Land use, Watersheds(Basins), Drainage, Sedimentation, Erosion, Storms, Geology.
Identifiers: *ERTS, *Anacostia basin.

An analysis has been made of the effects of urbanization and highway construction on run-off, erosion and siltation on the Anacostia watershed. The analysis was based on changes in land use patterns as determined from aerial photographs as well as geologic and hydrologic data for the region. Two selected subwatersheds of Indian Creek and one of Little Paint Branch of the Northeast Branch of the Anacostia were studied in terms of three hypothetical storms of different magnitudes. It was determined that an approximately 10% increase in impervious surface could bring about a 12% increase in the peak discharge for storms of the magnitude of tropical storm Agnes, a 20% increase in peak discharge for 10 hours storm and as much as a 150% increase in peak discharge for a typical thunderstorm. Also the early hourly incremental discharge from a storm of Agnes' magnitude could be increased by as much as 100%. Correspondingly large effects were observed in soil erosion and siltation from bare construction sites which show sediment yields of up to hundreds of thousands of tons per square mile per year. The effects of rapid run-off, erosion and siltation are interrelated with other environmental problems such as sewage, oil and chemical pollution and lack of adequate public transportation. The net result is one of a steady degradation of the urban and suburban environment and of the estuary and bay into which this river flows. (Sims-ISWS)
W76-07568

RUNOFF STUDIES ON SMALL WATERSHEDS,
West Virginia Univ., Morgantown. Water Research Inst.
For primary bibliographic entry see Field 2A.
W76-07673

APPLICATIONS OF REMOTE SENSING TO WATERSHED MANAGEMENT,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 4A.
W76-07791

ERODIBILITY OF TAHOE SOILS,
For primary bibliographic entry see Field 2J.
W76-07799

NON-POINT POLLUTION IN THE POTOMAC RIVER BASIN,
Interstate Commission on the Potomac River, Bethesda, Md.
For primary bibliographic entry see Field 5B.
W76-07820

WATERSHED PROJECTS.
For primary bibliographic entry see Field 6E.
W76-07866

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1975,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2E.
W76-08049

FLOOD PEAK ESTIMATES FROM SMALL RURAL WATERSHEDS,
Federal Highway Administration, Washington, D. C.
For primary bibliographic entry see Field 2A.
W76-08077

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

CHESAPEAKE BAY RADIOACTIVE TRACER STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5B.
W76-07460

ENVIRONMENTAL MONITORING THROUGH THE USE OF EXPOSURE PANELS,
William F. Clapp Labs., Inc., Duxbury, Mass.
R. E. Hillman.
In: Fisheries and Energy Production: A Symposium, p 55-76, 1975, 5 fig, 6 tab, 33 ref.

Descriptors: *Monitoring, *Equipment, Algae, Annelids, Populations, Water quality.
Identifiers: *Exposure panels, Millstone Point, New Haven Harbor, Stamford Harbor.

Exposure panels were made of white pine with a transite facing. Monitoring sites in Long Island Sound were at Millstone Point, New Haven Harbor, and Stamford Harbor. Species diversity indexes for algal and annelid populations as they occurred on the panels were calculated for the period from 1968 to 1973. Increases in diversity indexes over time indicated possible changes in water quality. Far more species were found on the Millstone Point panels although the number of phyla found on the panels exposed at all three sites were not significantly different. (See also W76-07487) (Chilton-ORNL)
W76-07490

IMPROVED FORMAZAN TEST FOR THE DETERMINATION OF THE DEHYDROGENASE ACTIVITY OF ACTIVATED SLUDGE IN WASTE WATER TREATMENT PLANTS FOR THE JOINT BIOLOGICAL PURIFICATION OF URBAN AND TANNERY-GENERATED WASTE WATERS (VERFEINERTER FORMAZANTEST DER DEHYDROGENASENAKTIVITAET VON BELEBTSCHLAEMMEN IN ANLAGEN ZUR GEMEINSAMEN BIOLOGISCHEN REINIGUNG VON GERBEREIABWAESSERN UND STAEDTISCHEN ABWAESSERN),
For primary bibliographic entry see Field 5D.
W76-07518

TRACE ELEMENTS IN SURFACE WATERS OF THE KARAGANDA OBLAST, (IN RUSSIAN),
For primary bibliographic entry see Field 2K.
W76-07528

EXTRACTIVE-POLAROGRAPHIC DETERMINATION OF STYRENE AND METHYLMETACRYLATE IN INDUSTRIAL WASTE WATERS (EKSTRAKTSIONNO-POLYAROGRAFICHESKOYE OPREDELENIYE STIROLA I METILMETAKRILATA V PROMYSHLENNYKH STOCHNYKH VODAKH),
O. V. Meshkova, and V. N. Dmitriyeva.
Zovodskaya Laboratoriya, Vol. 40, No. 1, p 28-29, 1974.

Descriptors: *Pollutant identification, *Chemical wastes, *Waste water(pollution), Electrodes, Analytical techniques, *Polarographic analysis, Separation techniques, Industrial wastes.
Identifiers: Styrene, Methylmetacrylate.

A method for the extraction and polarographic determination of styrene and methylmetacrylate in waste waters generated in plastic scintillator production is presented. Extraction was done by means of benzene used in such a quantity that the final ratio of waste water to extract amounted to 1:20. Prior to the polarographic determination, the extract was diluted with 0.05 N-solution of styrene or methylmetacrylate in 95 percent dimethylformamide. Polarographic determination was done in an electric polarograph with a mercury drop electrode against standard solutions. Quantitative determination was performed by means of calibration curve. (Takacs-FIRL)
W76-07544

PITTSBURGH RAINWATER ANALYSIS BY PIXE,
Pittsburgh Univ., Pa.
K. C. Chan, B. L. Cohen, J. O. Frohliger, and L. Shabason.
Tellus, Vol. 28, No. 1, p 25-30, 1976. 5 fig, 2 tab, 13 ref.

Descriptors: *Rain water, Chemistry of precipitation, *Heavy metals, Sampling, Water chemistry, Chemical analysis, Water pollution, Air pollution, *Pollutant identification, Pollutants, Fallout, *X-ray analysis, X-ray fluorescence, X-ray spectroscopy, X-rays, Analytical techniques, On-site data collections, Meteorology, *Pennsylvania.
Identifiers: *Pittsburgh(Penn).

Concentrations of thirteen elements in rainwater from the Pittsburgh, Pennsylvania, area were analyzed by Charged Particle Induced X-ray Emission (PIXE). They were compared to rainwater in a rural area and air particulates in Pittsburgh. Local and non-local contributions were discussed. Washout ratios were calculated and found to be larger for smaller size particles, contrary to general belief. This work demonstrated the convenience of using PIXE. (Sims - ISWS)
W76-07555

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME I - OHIO AND WABASH RIVER BASINS,
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07570

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 2 - ILLINOIS, FOX, SANGAMON, AND KANKAKEE BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07571

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 3 - DES PLAINES RIVER BASIN.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07572

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 4 - MISSISSIPPI RIVER (SOUTH, SOUTH CENTRAL, CENTRAL, NORTH CENTRAL, NORTH), BIG MUDDY RIVER, KASKASKIA RIVER, AND ROCK RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07573

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 5 - LAKE MICHIGAN AND ITS TRIBUTARIES.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07574

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 1 - OHIO AND WABASH RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07575

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 2 - ILLINOIS, FOX, SANGAMON, AND KANKAKEE BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07576

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA - VOLUME 3, DES PLAINES RIVER BASIN.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07577

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 4 - MISSISSIPPI RIVER (SOUTH, SOUTH CENTRAL, CENTRAL, NORTH CENTRAL, NORTH), BIG MUDDY RIVER, KASKASKIA RIVER, AND ROCK RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07578

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 5 - LAKE MICHIGAN AND ITS ILLINOIS TRIBUTARIES.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07579

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, 1975--A BASIC-DATA REPORT,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W76-07588

AVAILABILITY OF GROUND WATER IN THE PEMIGEWASSET AND WINNIPESAUKEE RIVER BASINS, CENTRAL NEW HAMPSHIRE,
Geological Survey, Concord, N. H.
For primary bibliographic entry see Field 7C.
W76-07589

REFERENCE GUIDE TO METHODOLOGY FOR THE ANALYSIS OF ORGANIC COMPOUNDS.
Geological Survey, Bay St. Louis, Miss.
R. A. Baker, and M. L. Yates.
Open-file report, December 1975. 136 p.

Descriptors: *Pollutant identification, *Water analysis, *Organic compounds, *Methodology, *Analytical techniques, Sampling, Waste water(pollution), Pesticides, Oil, Phenols, Oxygen demand, Detergents, Physical properties, Chemical properties, Industrial wastes, *Water quality standards.
Identifiers: *Water analysis reference guide, Sample preparation, Sample preservation.

This compilation of organic-related analytical techniques was initiated to assist the methods development group of the central laboratories of the U.S. Geological Survey. Details of the procedures are not included. Instead, the compilation summarizes methodology currently employed in research and field studies. Although some methods have been published and standardized, others are unknown beyond the laboratory in which they were developed. The objective is to document these techniques and thus reduce the possibility of repeating developments or of using less effective methods. The literature reference and (or) the individual (laboratory) contact are indicated rather than the analytical detail. The user of this compilation is expected to examine the reference or contact the appropriate individual if the method is unpublished. Hopefully this will facilitate response of the central laboratories to the needs of district (field) personnel. (Woodard-USGS)
W76-07590

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 2. KING AND SNOHOMISH COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-07591

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 1. CLALLAM, ISLAND, JEFFERSON, SAN JUAN, SKAGIT, AND WHATCOM COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-07592

RECONNAISSANCE OF THE WATER RESOURCES OF THE UPPER KLICKITAT RIVER BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4A.
W76-07594

GEOHYDROLOGY OF THE LAKE AREA AT KATHRYN ABBEY HANNA PARK, JACKSONVILLE, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W76-07602

CHEMICAL CHARACTERISTICS OF THE LOWER KISSIMMEE RIVER, FLORIDA--WITH EMPHASIS ON NITROGEN AND PHOSPHORUS,
Geological Survey, Tallahassee, Fla.
A. G. Lamonds.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250-938, $6.00 printed copy; $2.25 microfiche. Water-Resources Investigations 45-75, November 1975. 133 p, 22 fig, 39 tab, 17 ref.

Descriptors: *Water quality, *Florida, *Surface waters, *Chemical properties, *Biological properties, Chemical analysis, Data collections, Nitrogen, Phosphorus, River basins, Impoundments, Stratification, Reservoir releases, Streamflow, Ion transport.
Identifiers: *Lower Kissimmee River(Fla).

The impoundments in the lower Kissimmee River in Florida contained calcium bicarbonate water with an average dissolved solids concentrtion less than 160 mg/l. Concentrations of dissolved solids and phosphorus increased and nitrogen decreased downstream. During warm weather the impoundments were often stratified and water near the bottom often contained very little dissolved oxygen but relatively high concentrations of ammonia nitrogen and phosphorus. During stratifications, bottom releases from these impoundments often resulted in higher concentrations of ammonia nitrogen and phosphorus below the structures than above them. From July 1971 through June 1972 the Kissimmee River carried 268,000 tons of dissolved solids, including 2,330 tons of nitrogen and 135 tons of phosphorus into Lake Okeechobee. The lower part of the basin (below Lake Kissimmee) contributed about 60 percent of the flow, 49 percent of the nitrogen load, and 86 percent of the phosphorus loads at the most downstream control structure. (Woodard-USGS)
W76-07603

SPRINGS OF PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 2F.
W76-07604

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, MAY 1974,
Geological Survey, Denver, Colo.
W. Thordarson, and W. C. Ballance.
Contract report USGS-474-226 (Amchitka-45) for U S Energy Research and Development Administration, 1976. 19 p, 3 fig, 3 tab, 9 ref. USERDA Agreement E(29-2)-474.

Descriptors: *Radiochemical analysis, *Water analysis, *Nuclear explosions, *Underground, *Alaska, Water pollution sources, Nuclear wastes, Tritium, Baseline studies, Evaluation, Path of pollutants.
Identifiers: *Amchitka(Alaska).

During May 1974, the U.S. Geological Survey collected water samples from Amchitka Island, Alaska. Tritium determinations were made on 99 water samples, and dissolved gross alpha and gross beta/gamma determinations were made on 34 water samples. No appreciable differences were found between the data obtained in May 1974 and the data obtained before the Cannikin underground nuclear explosion on November 6, 1971. Water samples were collected from wells, streams, lakes, springs, and seeps. Seawater samples were collected both at the shoreline and offshore. (Woodard-USGS)
W76-07606

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, AUGUST 1974, AND CHEMICAL MONITORING FROM JULY 1972 TO JUNE 1974,
Geological Survey, Denver, Colo.
W. Thordarson, and W. C. Ballance.
Contract report USGS-474-225 (Amchitka-44) for U S Energy Research and Development Administration, 1976. 19 p, 3 fig, 3 tab, 10 ref. USERDA Agreement E(29-2)-474.

Descriptors: *Radiochemical analysis, *Water analysis, *Nuclear explosions, *Underground, *Alaska, Baseline studies, Water quality, Groundwater, Surface waters, Tritium, Chemical analysis, Water pollution, Evaluation.
Identifiers: *Amchitka Island(Alaska).

Radiochemical data from the Amchitka Island, Alaska, study area were obtained from water samples collected by the U.S. Geological Survey during August 1974. Tritium determinations were made on 18 samples, and gross alpha and gross beta/gamma determinations were made on 12 samples. No appreciable differences were found between the data obtained during August 1974 and the data obtained before the Cannikin event (underground nuclear detonation Nov. 6, 1971). Chemical analyses were made on 4 samples collected in 1971, 15 samples in 1972, 11 samples in 1973, and 7 samples in 1974. Comparison of these analyses to analyses of samples collected before the Cannikin event indicates no changes outside of

the seasonal range normally found at the sampling locations. (WoodardnUSGS)
W76-07607

LAKE ERIE, OHIO, PENNSYLVANIA, NEW YORK INTAKE WATER QUALITY SUMMARY 1972,
Environmental Protection Agency, Fairview Park, Ohio.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 591, $11.00 in paper copy, $2.25 in microfiche. December 1973. 403 p. 1 fig., 4 tab.

Descriptors: *Potable water, *Lake Erie, *Water analysis, *Intakes, Ohio, Pennsylvania, New York, Water properties, Monitoring, *Data collections, Chemical properties, Physical properties, Bottom sediments, Coliforms, Water temperature, Hydrogen ion concentration, Conductivity, Alkalinity, Turbidity, Color, Odor, Suspended solids, Dissolved solids, Hardness(Water), Chlorides, Sulfates, Ammonia, Nitrogen compounds, Phosphorus compounds, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand, Phenols, Detergents, Silica, Zinc, Copper, Chromium, Iron, Nickel, Cadmium, Lead, Mercury, Arsenic compounds, Manganese, Fluorides, Enteric bacteria, Phytoplankton, Zooplankton, Heavy metals, Toxins.
Identifiers: Cyanide, Silver, Barium, Selenium, STORET.

Progress made on the cooperative water quality surveillance program between the Ohio Environmental Protection Agency, New York State Department of Environmental Conservation, Pennsylvania Department of Environmental Resources, municipalities, and the EPA at 21 water treatment intakes in Lake Erie during 1972 is detailed. The program is part of a system for monitoring interstate waters by participating state and municipal agencies for water quality standards compliance and supplements federal surveillance efforts of Lake Erie. Water quality information is entered into the STORET data processing system. Water intake physical data and the chemical, physical, and biological characteristics of the sediment in each intake area are described. Water chemical and microbiological data includes temperature, pH, conductivity, alkalinity, turbidity, color, odor total solids, total dissolved (filterable) solids, total suspended (non-filterable) solids, hardness, chlorides, sulfates, cyanide, nitrite nitrogen, nitrate nitrogen, ammonia nitrogen, albuminoid nitrogen, total phosphorus, soluble phosphorus, chlorine demand, dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, phenols, methylene blue active substances (anionic detergents), dissolved silica, zinc, silver, copper, hexavalent chromium, chromium, iron, nickel, cadmium, barium, lead, mercury, arsenic, selenium, manganese, fluoride, total and fecal coliforms, total bacteria, and phytoplankton and zooplankton evaluations plus air temperature, wind direction and velocity studies. (Buchanan-Davidson--Wisconsin).
W76-07610

WRC AIDS UNIQUE WATER QUALITY MONITORING PROJECT.
Water Pollution Research Lab., Stevenage (England).
Water Research Newsheet, February 1976, p. 5. 2 fig.

Descriptors: *Water quality, *Monitoring, *Intakes, Automatic control, Equipment, Design, Europe, *Pollutant identification, Analytical techniques.
Identifiers: England.

The schematic of a water quality monitoring station, designed to protect a water intake on the River Wear, England, is illustrated. The system will be installed 2-1/2 miles upstream from the intake and will measure dissolved oxygen, temperature, turbidity, ammonia, organic pollutants, and water levels. Via a dual-sensor configuration, one sensor monitors raw water and the other clean water; if the former indicates a value outside present limits the sensors are switched over by means of a novel valve system to provide a check. Readings will be continuously relayed by telemetric links to the water treatment plant for proper action. The system will be supplemented by some form of biological monitoring to provide an alert for toxic substances. (Auen-Wisconsin).
W76-07613

POLLUTANTS 'FINGERPRINTED' BY RADIOACTIVE METHOD.
California Geology, Vol. 26, No. 11, p 276-277, November, 1973. 1 fig.

Descriptors: Waste water treatment, *Industrial wastes, *Oil industry, Carbon radioisotopes, Oil wastes, *Pollutant identification, Analytical techniques, Radioactivity techniques, Radioisotopes, Water pollution sources, *Organic wastes.
Identifiers: *Radioactive fingerprinting.

Radioactive fingerprinting of organic wastes, by separating the major types of carbon compounds, will aid pollution-control agencies with organic-pollution abatement and litigation problems. The radioactive fingerprinting method measures the differences in amounts of radioactive carbon isotopes found in fossil and modern organic pollutants. The fossil fuel waste discharged by petrochemical plants contains no radioactive carbon-14, while the organic wastes from sewage and feedlots will reflect the current atmospheric concentrations of carbon-14. A comparison of the concentrations of carbon-14 in a polluted stream to modern atmospheric concentrations allows the determination of the quantity of organic pollution derived from fossil fuels and the quantity from modern wastes. (Sandoski-FIRL)
W76-07629

NEW OIL POLLUTION DETECTOR.
Water and Waste Treatment, Vol. 16, No. 10, p 16, October, 1973. 1 fig.

Descriptors: Waste water treatment, *Industrial wastes, Oil industry, *Oil wastes, *Pollutant identification, Analytical tehniques, Equipment, *Monitoring, *Separation techniques, Rivers, Oceans, Oil pollution.

After several years of research by International Combustion of Derby, an oil pollution monitoring system has been developed. The oil pollution detector, Type 4979, is a completely weatherproof instrument which has been designed for the continuous monitoring of oil in industrial effluent, river and sea water. A sampling system has been designed for use with the monitor by Megator Pumps and Compressors Limited. The sampling system skims the surface of the water and passes a sample to the unit. An alarm is activated by the monitor if an abnormal amount of oil is present. Samples can also be obtained by the use of a discharge pipe. A sophisticated oil separation system enables the monitor to separate oil from any other contaminants found in the water. (Sandoski-FIRL)
W76-07630

ACCUMULATION OF MERCURY BY FISH OF THE LITTLE PINEY RIVER AND MILL CREEK,
Missouri Univ., Rolla. Dept. of Chemistry.
J. O. Stoffer, W. T. Schrenk, and E. T. Lloyd.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-252 941, $4.00 in paper copy, $2.25 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, March 26, 1976. 32 p, 5 fig, 2 tab, 20 ref. OWRT A-083-MO(1) 14-31-0001-5025.

Descriptors: *Mercury, Freshwater animals, Fish, *Absorption, *Missouri, *Trout, *Pollutant identification, Bioassay, Streams, Analytical techniques, Water quality.
Identifiers: *Flameless atomic absorption.

A study of mercury accumulation in trout taken from the trout parks and streams of southern Missouri is presented. Mercury in trout is determined by digestion in nitric acid, sulfuric acid, and potassium permanganate, followed by reduction and aeration for measurement by flameless atomic absorption. The mercury accumulation in trout collected and analyzed in this project ranged from 0.1 to 0.3 ppm mercury (microgram mercury/g of tissue). The mercury levels were relatively constant and showed no variation or higher level accumulation with increased size. Levels in the liver were slightly higher than levels in the flesh of the same trout. Previous analysis of trout collected in the mid to late 1950's from the Little Piney River indicated mercury accumulations of approximately 3 ppm. Over the past 25 years, there has been a substantial decrease in mercury found in trout of southern Missouri as a result of cleaner streams.
W76-07670

DETECTION OF TRACE PHOSPHORUS IN NATURAL WATERS BY GRAPHITE OVEN FLAME ANALYSIS,
Georgia Univ., Athens. Dept. of Chemistry.
D. R. Campbell.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-252 952, $4.00 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report ERC-0276, February 1976, 37 p, 9 fig., 1 tab, 22 ref. OWRT A-061-GA(1). 14-31-0001-5010.

Descriptors: *Phosphorus, *Flame photometry, Analysis, Nutrients, *Pollutant identification, Photometry, Analytical techniques, Chemical analysis, Methodology, Trace elements, Water analysis, Instrumentation.
Identifiers: Graphite furnace.

Phosphorus is analyzed by coupling a graphite furnace to a flame photometer. A sample is added to the furnace where it is dried and vaporized at temperatures which can be as high as 2800 C. The sample is swept out of the furnace by nitrogen mixed with air, and drawn into a hydrogen-air flame. In the flame, POH emission is observed and integrated. The emission is subject to interference from calcium and ferric iron; however, by adding a 'constant matrix' of calcium and EDTA to both samples and standards, it was possible to determine total phosphorus in sewage samples. This method has a detection limit of 3 micrograms g/liter phosphorus. The relative standard deviation on repeat measurements of a solution containing 1 mg/liter phosphorus was between 2 and 3%. An analysis, including sample pretreatment, requires less than two minutes. The instrumentation can be used in mobile laboratories for field analyses. Because of its greater sensitivity and reduced time requirement, this method is a superior alternative to present methods for phosphorus. It will be very useful in rapidly screening water samples for high levels of phosphorus.
W76-07672

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES, VOLUME III,
Ontario Inst. for Environmental Studies, Toronto.
J. C. Van Loon.
Research Report No. 30, Training and Technology Transfer Division (Water), Environmental Protection Services, Environment Canada, Ottawa, Canada, 37 p., 2 fig., 10 tab, 22 ref., (1976). 72-5-3.

Descriptors: *Heavy metals, *Sewage, *Sludge, Agriculture, *Lands, Metals, *Sewage sludge, Analysis, Absorption, Mercury, Molybdenum, Gas chromatography, Canada, Chemical analysis, *Pollutant identification.
Identifiers: Electro-chemical techniques, Arsenic, Selenium, Tin, Thermal volatility, Ontario, Sludge analysis.

Existing and newly developed methods for the analysis of metals in sewage sludges are described. Atomic absorption and electro-chemical techniques are emphasized. Procedures developed specifically for arsenic, selenium, mercury, tin and molybdenum analyses are included. The quartz 'T' tube furnace for flameless atomic absorption studies of thermal volatility and gas chromatography of metal compounds in sludge has been developed and is described. A number of chemical sewage sludges were analysed for metals and the results are tabulated. (Environment Canada)
W76-07676

SURVEILLANCE METHODOLOGY - 1974,
Canada Centre for Inland Waters, Burlington (Ontario); and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
T. J. Carew, and D. J. Williams.
Technical Bulletin No. 92, 1975, 28 p., 15 fig., 6 ref, append.

Descriptors: *Lake Ontario, *Water quality, *Surveys, *Methodology, Temperature, Colour, Instrumentation, Water properties, Water analysis, International Joint Commission, *Pollutant identification.
Identifiers: Shipboard procedures.

In 1974, a pilot surveillance program was implemented on Lake Ontario to meet the requirements of the International Joint Commission for information on areas of improving or deteriorating water quality, general lake-wide conditions and responses to the impact of management procedures. This report entails documentation and discussion of parameters, analytical methodology and shipboard procedures. (Environment Canada)
W76-07679

ORGANOCHLORINE PESTICIDE RESIDUES IN CULTURED FISHES OF TAIWAN,
Academia Sinica, Taipei (Taiwan). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W76-07697

HIGH-SPEED LIQUID CHROMATOGRAPHIC CLEANUP OF ENVIRONMENTAL SAMPLES PRIOR TO THE GAS CHROMATOGRAPHIC DETERMINATION OF LINDANE,
Canada Centre for Inland Waters, Burlington (Ontario).
R. H. Larose.
J Assoc Off Anal Chem. 57(5), p 1046-1049, 1974.

Descriptors: Sampling, *Environment, *Cleaning, *Chromatography, *Gas chromatography, *Pollutant identification.
Identifiers: *Lindane, Liquid chromatography.

A method is described which permits the removal of interfering co-extractives from lindane, using high-speed liquid chromatography. Fractions are collected from the liquid chromatograph for further analysis by gas-liquid chromatography. The cleanup procedure takes less than 5 min and recoveries of more than 90% are obtained. The detection limit for water samples is 5 ng/L. Copyright 1974, Biological Abstracts, Inc.
W76-07701

DETERMINATION OF ZINC AND CADMIUM IN ENVIRONMENTALLY BASED SAMPLES BY THE RADIOFREQUENCY SPECTROMETRIC SOURCE,
Oak Ridge National Lab., Tenn.
Y. Talmi.
Anal Chem. 46(8), p 1005-1010, 1974.

Descriptors: *Cadmium, *Zinc, *Sampling, Trace elements, Spectroscopy, Environment, Analysis, *Analytical techniques, Coal, Flyash, Gasoline, Soil, Cattle, Leaves, Fish, Gonads, *Pollutant identification.
Identifiers: *Radiofrequency furnace spectrometry, Bunker oil, Liver.

The applicability of the radiofrequency furnace (RFF) spectrometric source to the analysis of trace amounts of Cd and Zn in environmental samples is described. Modifications in the original design of the system were employed to enhance sensitivity and reduce interferences. Both atomic absorption (AA) and atomic emission (AE) spectrometric modes were successfully used with samples pretreated by various methods such as wet ashing, on-substrate wet ashing and Soluene solubility, and by direct analysis. Samples analyzed include coal, fly ash, bunker oil, gasoline, soil, bovine liver, orchard leaves and fish gonad. The samples, once prepared, were analyzed at the rate of 5 per minute with an average overall accuracy of 6.8% and reproducibility of 5.5%. Detection limits for Cd and Zn were 5 pg with the AA mode and 6 and 8 pg, respectively, with the ZE mode. Relative sensitivities are in the 0.001-0.5 ppm range. Interferences in the 2 operating modes are compared. Copyright 1974, Biological Abstracts, Inc.
W76-07702

ANALYSIS OF THE POLYCHLORINATED BIPHENYL PROBLEM, APPLICATION OF GAS CHROMATOGRAPHY-MASS SPECTROMETRY WITH COMPUTER CONTROLLED REPETITIVE DATA ACQUISITION FROM SELECTED SPECIFIC IONS,
National Environmental Research Center, Cincinnati, Ohio. Analytical Quality Control Lab.
J. W. Eichelberger, L. E. Harris, and W. L. Budde.
Analytical Chemistry, Vol. 46, No. 2, p 227-232, February, 1974. 6 fig, 3 tab.

Descriptors: *Gas chromatography, *Mass spectrometry, *analytical techniques, Computers, Ions, Monitoring, Pesticides, *Pollutant identification, Water pollution sources, Lakes, *Polychlorinated biphenyls.

An application of gas chromatography-mass spectrometry with computer controlled repetitive data acquisition from selected specific ions was used for polychlorinated biphenyl (PCB) analysis. The application of subset data acquisition techniques were examined for the possibility of a procedure which is sufficiently sensitive, but which eliminates the need for elaborate separations, and does not sacrifice too much of the qualitative information content inherent in a complete mass spectrum. Several sets of candidate masses were evaluated using PCB's mixed with certain pesticides which are likely to be in a solvent extract of an environmental sample. The method has also been tested with a contaminated sediment sample from an Ohio lake and appears useful for both qualitative and quantitative analyses. (Sandoski-FIRL)
W76-07709

FLUORESCENT WHITENING AGENTS: ACUTE FISH TOXICITY AND ACCUMULATION STUDIES,
Procter and Gamble Co., Cincinnati, Ohio. Environmental Water Quality Research Dept.
For primary bibliographic entry see Field 5C.
W76-07713

DECHLORINATION OF MUNICIPAL SEWAGE USING SULFUR DIOXIDE,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
For primary bibliographic entry see Field 5C.
W76-07715

METHOD FOR ASSESSMENT OF TOXICITY OR EFFICACY OF MIXTURES OF CHEMICALS,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
For primary bibliographic entry see Field 5C.
W76-07718

SATELLITES HELPING TO SOLVE DOWN-TO-EARTH CIVIL ENGINEERING PROBLEMS.
For primary bibliographic entry see Field 7B.
W76-07737

WATER DATA COLLECTION AND USE,
Department of the Environment, London (England). Water Data Unit.
For primary bibliographic entry see Field 7C.
W76-07785

AIR QUALITY IN THE LAKE TAHOE BASIN,
California Univ., Davis. Inst. of Ecology; and California Univ., Davis. Dept. of Physics.
T. A. Cahill.
In: Proceedings: Lake Tahoe Research Seminar II, 27 September 1974, Sands Vagabond Convention Center, South Lake Tahoe, California. Report No. NSF/RA/G-74-012, p 63-68. 1 ref.

Descriptors: *Air pollution, *Aerosols, Sulfur, Haze, Pollutants, Mountains, Lakes, Fuels, Fossil fuels.
Identifiers: *Lake Tahoe(Nev-Calif), *Air pollution sources, Visibility.

Lake Tahoe is over twenty miles long, yet we expect to see the mountains on the far side--an important part of the scenic value. Thus, a significant part of the recreational value of the lake is based upon visibility greater than thirty miles most of the time. The problem of area-wide degradation of visibility is one which is vital to Lake Tahoe's future. Other sites in California show that fine sulfur particulates are likely to be responsible for the hazes presently seen at Lake Tahoe on many summer days. There are four sources of fine sulfur aerosols that could cause problems: (1) fuel oil combustion in the basin; (2) the conversion of residual sulfur in gasoline into fine sulfur particulates, an unfortunate byproduct of the EPA mandated catalytic converters on new cars sold in California; (3) the landing-take off cycle of a Boeing 727, which produces as much sulfur oxides as about 500 cars driving from Meyers to Stateline; and (4) transport of fine sulfur particulates present in the Sacramento valley or Reno area into the basin. (See also W76-07793) (Sims-ISWS)
W76-07797

POLLUTION: CONCEPT AND DEFINITION,
Australian National Univ., Canberra. Dept. of Forestry.
For primary bibliographic entry see Field 5G.
W76-07955

ORGANIC SUBSTANCES IN POTABLE WATER AND IN ITS PRECURSOR: II. APPLICATIONS IN THE AREA OF ZURICH,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland); and Eidgeneossische Technische Hochschule, Zurich (Switzerland). Gas Chromatography Lab.
K. Grob, and G. Grob.
J Chromatogr. 90(2), p 303-313, 1974.

Descriptors: *Potable water, *Organic wastes, Europe, Sampling, *Analytical techniques, Lakes, *Water pollution sources, *Pollutant identification.
Identifiers: Closed-loop air stream, Lake Zurich, *Switzerland, Zurich.

The method of transferring organic substances from water at room temperature on to an adsorbent filter by a closed-loop air stream was applied to various water samples. These include water from Lake Zurich (Switzerland) taken at different depths and under different weather conditions, as well as relatively pure samples of spring, ground and tap water. In a sample of accidentally contaminated water the degree and the (unexpected) source of contamination were determined, neither of which could be done by commonly used methods. The characteristics and origin of various water pollutants and concentrations of selected pollutants are given. (See also W75-08556)--Copyright 1974, Biological Abstracts, Inc.
W76-07956

THE DISTRIBUTION OF STIGEOCLONIUM TENUE KUTZ. IN SOUTH WALES IN RELATION TO ITS USE AS AN INDICATOR OF ORGANIC POLLUTION,
University Coll. of Wales, Aberystwyth. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5B.
W76-07957

THE PRESERVATION AND STORAGE OF URINE SAMPLES FOR THE DETERMINATION OF MERCURY,
Los Alamos Scientific Lab., N. Mex. Health Div.; and Los Alamos Scientific Lab., N. Mex. Bio-Analysis and Chemical Section.
P. Trujillo, P. Stein, and E. Campbell.
Am Ind Hyg Assoc J. 35(5), p 257-261, 1974.

Descriptors: Analytical techniques, *Mercury, *Sampling, *Urine, Preservation, *Pollutant identification.
Identifiers: Containers, Glass containers, Paper containers, Plastic containers.

The use of various preservatives and storage containers for the sampling of (human) urine and water samples for Hg analysis was evaluated. Glass storage containers were preferred over paper or plastic containers. Potassium persulfate, when added to the sample at the time of collection preserved the sample for several days without significant losses. Potassium permanganate was unacceptable for preserving Hg in aqueous solution because of the formation of insoluble manganese dioxide.--Copyright 1974, Biological Abstracts, Inc.
W76-07959

INCREASE OF THE EFFECTIVENESS OF DIRECT DETECTION OF VIRUSES IN SURFACE WATERS BY ULTRAFILTRATION THROUGH SOLUBLE ULTRAFILTERS, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
Z. S. Nikolaevskaya, and M. S. Aizen.
Gig Sanit. 4, p 68-70, 1974.

Descriptors: *Pollutant identification, *Viruses, Surface waters, Filters, Filtration, Methodology, Analytical techniques.
Identifiers: Picornavirus, Poliovirus, *Uitrafiltration.

A number of methods for purifying and concentrating viruses (type I poliovirus, Mahoney strain) in surface waters were studied under experimental and natural conditions. The data indicated the high sensitivity of the method of ultrafiltration through soluble lanthanum aluminum alginate ultrafilters in comparison with gauze pads. The manufacture of the soluble ultrafilters is described.--Copyright 1975, Biological Abstracts, Inc.
W76-07960

ISOTOPIC RATIOS OF RADIORUTHENIUM AND RADIOCERIUM IN RAIN WATER AT OSAKA IN RELATION TO NUCLEAR EXPLOSIONS DURING THE PERIOD OF LATE 1969 TO 1972,
Radiation Center of Osaka Prefecture, Osaka (Japan). Dept. of Physical Instrument.
T. Matsunami, A. Mizohata, and T. Mamuro.
J Radiat Res. 15(2), p 96-102, 1974.

Descriptors: *Rain, *Radioactivity, *Nuclear wastes, Radioisotopes, Isotope studies, Pollutant identification.
Identifiers: *Cerium, *Explosions, Osaka, *Ruthenium, Stratosphere, Strontium, Troposphere, *Japan.

The isotopic activity ratios of 103Ru to 106Ru and 141Ce to 144Ce in rain water were studied during the period of late 1969- Aug. 1972. The ratios demonstrated many peaks during the observation period, each of which probably resulted from settlement of stratospheric or tropospheric nuclear debris produced by nuclear explosions during the same period. A method of distinguishing fresh nuclear debris from old debris on the basis of measured radiostrontium activity ratios was applied to estimate the contributions of the 106Ru and 144Ce produced by a new explosion to the total depositions of these nuclides from the measured activity ratios of 103Ru to 106Ru and 141Ce to 144Ce. The contributions thus estimated ranged from zero to nearly 100%, depending on various factors.
W76-07961

210PO RADIOACTIVITY IN ORGANS OF SELECTED TUNAS AND OTHER MARINE FISH,
Scripps Institution of Oceanography, La Jolla, Calif. Soledad Marine Radioactivity Lab.
For primary bibliographic entry see Field 5C.
W76-07962

MEASUREMENTS OF PHYTOL IN ESTUARINE SUSPENDED ORGANIC MATTER,
Naval Research Lab., Washington, D.C.
D. M. Schultz, and J. G. Quinn.
Mar Biol (Berl). 27(2), p 143-146, 1974.

Descriptors: *Suspended solids, Organic wastes, *Chlorophyll, Analytical techniques, *Gas chromatography, Chromatography, *Rhode Island, *Bays, *Estuarine environments, *Pollutant identification, Measurement, Spectrophotometry.
Identifiers: *Phytol, Narragansett Bay(RI), Isoprenold alcohol phytol.

The unsaturated isoprenold alcohol phytol is a constituent of the major chlorophyll species a and b and, as such, should be useful as an estimator for chlorophyll values. A method for the extraction of phytol from estuaring suspended organic matter and analysis by gas-liquid chromatography (GLC) is described. Comparisons of the GLC method for phytol.chlorophyll analyses and a spectrophotometric chlorophyll method indicate that the GLC method gives values in good agreement with the spectrophotometric procedure. Similar trends in suspended chlorophyll values were observed in Narragansett Bay (Rhode Island) water samples using the GLC method and a fluorometric procedure. The results of these studies indicate that the GLC method provides reliable analyses of chlorophyll and, although more time-consuming, has the advantage that other organic species can be analyzed in the same sample.--Copyright 1975, Biological Abstracts, Inc.
W76-07974

HEAVY METALS AS TRACE CONSTITUENTS IN NATURAL GROUNDWATERS AND POLLUTED,
Kiel Univ. (West Germany). Geologish-Palaeontologisches Institut und Museum.
G. Matthess.
Geol Mijnbouw. 53(4), p 149-156, 1974.

Descriptors: Metals, Effects, Toxicity, *Public health, Groundwater, *Pollutant identification, *Heavy metals.
Identifiers: Geochemical, Physiological effects.

The natural and man-made concentrations of heavy metals are discussed in terms of their abundance, geochemical mobility, and physiological effects on man. The many gaps of geochemical information about heavy elements in the ground should be filled, especially for those elements which are important to human health.--Copyright 1975, Biological Abstracts, Inc.
W76-07978

PREPARATION OF ALGAE FOR THE GAS CHROMATOGRAPHIC DETERMINATION OF LINDANE, (IN GERMAN),
Hamburg Univ. (West Germany). Institut fuer Hydrobiologic and Fischereiwissenschaft.
R. Diercking, and P.-D. Hansen.
Ber Dtsch Wiss Komm Meeresforsch. 23(3), p 326-329, 1974.

Descriptors: Algae, *Lindane, Hydrocarbons, *Cultures, Analytical techniques, Environment, Toxicology, Pollutants, *Pollutant identification, *Gas chromatography chlorinated hydrocarbon pesticides.
Identifiers: *Chlorella, *Dunaliella, Environmental toxicology, *Tests.

In connection with accumulation tests for the chlorinated hydrocarbon lindane in cultures of Dunaliella and Chlorella a method was developed to prepare the algae. A special filter preparation method resulted in a high recovery rate. (This study is relevant to environmental toxicology.)--Copyright 1975, Biological Abstracts, Inc.
W76-07979

THE MERCURY CONTENTS OF FISH FROM CARINTHIAN LAKES, (IN GERMAN),
Bundesanstalt fuer Virusseuchenbekampfung der Haustiere, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-07981

MERCURY IN SOME MARINE ORGANISMS FROM THE OSLOFJORD,
Oslo Univ. (Norway). Dept. of Marine Zoology.
For primary bibliographic entry see Field 5C.
W76-07982

THE PRESENT CONDITION OF WATER POLLUTION AND THE FUTURE PROBLEMS (SUISHITSU ODAKU NO GENJO TO KONGO NO MONDAITEN),
Japan Environmental Agency, Tokyo.
K. Hoashi.
Kankyo Gijutsu, (Environmental Conservation Engineering) Vol. 2, No. 1, p 14-21, January, 1973. 3 tab.

Descriptors: *Water quality, *Water pollution, Investigations, *Toxicity, Sampling, Standards, Cadmium, Lead, Mercury, Phosphorus, Chromium, Biochemical oxygen demand, Chemical oxygen demand, Pollutant identification.
Identifiers: Japan, Cyanogen, Arsenic, Coli baccilus.

A 1971 investigation of Japan's public water quality resulted in the following published information. Samples for the examination of toxic matter were collected at 1966 locations, and those for living

standards were collected at 1253 locations including 330 rivers, 9 lakes, and 68 sea locations. Toxicity was analyzed in 89,074 test samples with 0.6 percent failure to pass the acceptable quality standard; in 1970, the failure percentage was 1.4. As in 1970, cyanogen (1.2%), cadmium (0.7%), and lead (1.4%) were the elements that had highest failure rates. Other major toxic substances were alkyl mercury, organic phosphorus, chromium, arsenic, and total mercury. In the examination of environmental standards, 22.6 percent of the 76,757 samples failed to meet the requirements. For rivers, 30 to 70 percent failed to meet the standard BOD level and 50 to 70 percent of the samples failed to pass the standard for presence of coli baccilus. 43.9 percent failed to pass the standard for lakes and ponds. Of the 15,960 sea water samples, 17.8 percent failed to meet the COD standard. (Seigle-FIRL)
W76-08007

EFFICIENCY OF HEAVY METALS REMOVAL IN MUNICIPAL SEWAGE TREATMENT PLANTS,
Environmental Protection Agency, Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-08008

ULTRASONICS IN THE SEWAGE INDUSTRY,
Municipality of Metropolitan Seattle, Wash.
For primary bibliographic entry see Field 5D.
W76-08018

OXYGEN MEASUREMENT IN ACTIVATION BASINS WITH THE ZUELLIG-02-PROBE,
K. Scherb, and H. Bauer.
Wasser- und Abwasser-Forschung, Vol. 6, No. 3, p 93-94, 1973. 2 fig.

Descriptors: *Measurement, *Instrumentation, *Oxygen, *Activated sludge, Electrolytes, Analytical techniques, *Pollutant identification.
Identifiers: Oxygen sensors, Activation basins, *Zuellig oxygen probe.

Encouraging results have been gained during a three-month operation in an activated sludge basin using a Zuellig type oxygen sensor. The device, especially suited for long-term measurement of the oxygen content in activation basins, is operated according to the Toedt principle, providing polarization current between two different noble metals in an electrolyte solution. The magnitude of the polarization current is determined by the oxygen content of the medium. The probe is composed of a plastic tube with two metal rings (electrodes) at its lower extremity, which are continuously cleaned by a rotating grindstone. The probe is splash-proof, non-corrosive, and permits nearly maintenance-free, long-term measurements even under rough working conditions. (Tacaks-FIRL)
W76-08019

APPLICATION OF THE STAINTON SYRINGE METHOD TO THE ANALYSIS OF MERCURY IN NATURAL WATERS,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
J. A. J. Thompson, and F. T. McComas.
Environmental Letters, Vol. 5, No. 3, p 189-197, 1973. 1 fig, 1 tab, 12 ref.

Descriptors: Analytical techniques, *Mercury, *Water analysis, *Spectrophotometry, Measurement, *Pollutant identification, Separation techniques.
Identifiers: *Atomic absorption spectrophotometry.

A relatively inexpensive, simple, and precise method for the analysis of subnanogram quantities of mercury in natural waters involving the use of wet chemical procedures to preconcentrate the mercury and a 'semi-micro' method of analysis based on atomic absorption spectrophotometry is described. Through a combination of a solvent extraction procedure and a 'cold-vapor' technique, standard deviations of plus or minus 0.0112 can be obtained at the mean concentrations of 0.023 and 0.166 ng/ml, respectively. Recoveries of 94 percent are reported. (Sandoski-FIRL)
W76-08025

AN IMPROVED METHOD FOR THE ISOLATION OF PHENOLS FROM WATER,
Washington and Jefferson Coll., Pa. Dept. of Chemistry.
J. A. Vinson, G. A. Burke, B. L. Hager, D. R. Casper, and W. A. Nylander.
Environmental Letters. Vol. 5, No. 3, p 199-207, 1973. 2 tab, 6 ref.

Descriptors: *Analytical techniques, *Phenols, *Water analysis, Colorimetry, Sampling, Adsorption, *Pollutant identification, Separation techniques, *Methodology.
Identifiers: Aminoantipyrine.

A rapid and sensitive method for the separation and isolation of phenols from waters has been developed which uses a column adsorption and desorption procedure prior to the analysis by colorimetry with aminoantipyrine. In comparison with separation by distillation, this method is accurate and precise and agrees well with the widely used distillation procedure. The column procedure is faster and requires less laboratory space than the distillation procedure. A typical analysis of 5 liters of 10 micrograms/liter phenol requires only 45 minutes. The sensitivity of the method is not dependent on the colorimetry but only on the volume of water analyzed. The column procedure thus allows sub-microgram/liter concentrations to be analyzed using conventional colorimetry instead of expensive gas chromatography instrumentation by simply sampling and analyzing greater than 50 liters of water. (Sandoski-FIRL)
W76-08026

A NEW CONVENIENT METHOD FOR DETERMINING ARSENIC(+3) IN NATURAL WATERS,
Rutgers The State Univ., New Brunswick, N. J. Dept. of Environmental Sciences.
W. H. Clement, and S. D. Faust.
Environmental Letters, Vol. 5, No. 3, p 155-164, 1973. 1 fig, 3 tab, 16 ref.

Descriptors: *Analytical techniques, *Arsenic compounds, *Water analysis, Investigations, Surface waters, Groundwater, *Pollutant identification.
Identifiers: Arsenate, Arsenite.

A convenient method for the determination of arsenic(+3) in natural waters based on a simple modification of the silver diethyl-dithiocarbamate 'Standard Method' for inorganic arsenic is described. In practice the technique was found to detect an average of 96 percent of the As(+3) present in samples. Less than one percent of any As(+5) present was analyzed as As(+3) by the method. The analytical procedure was used successfully to investigate surface waters, groundwater, and simulated reservoir water. In combination with the current 'Standard Method', the newly developed procedure allows an easy sorting of the inorganic arsenic in the waters into As(+3), arsenite, and As(+5), arsenate. (Sandoski-FIRL)
W76-08027

DATA TRANSMISSION SYSTEM MONITORS RIVER POLLUTION.
Control and Instrumentation, Vol. 5, No. 7, p 11, July/August, 1973.

Descriptors: *Data transmission, *Monitoring, Rivers, Water pollution sources, Floods, Warning systems, Rainfall, Path of pollutants, Pollutant identification.
Identifiers: Devon River Authority, Telephone system, River level.

A low-cost data transmission system developed in conjunction with the Devon River Authority, which uses the public telephone network to provide continuous monitoring of river pollution and/or give early flood warnings, has been developed by Delta Controls Ltd., of Kingston-on-Thames. Known as the Deltrol TeleGen systems, the solid-state equipment can be used to monitor rainfall and river levels at each of the remote stations to be monitored. Each channel in use is dedicated to a function and scanned and transmitted in order. If a reading needs to be double-checked, it is only necessary to replace the receiver and dial the number again. The memory is not reset if interrogated by accident and because it is continually up-dated, the risk of outside interference is eliminated. Apart from the initial cost of the equipment, the only other expenditure required is a low rental charge for a telephone at the stations. (Sandoski-FIRL)
W76-08028

GEOLOGY AND GROUND-WATER RESOURCES OF HETTINGER AND STARK COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 4B.
W76-08043

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 9 AND 10. COLORADO RIVER BASIN AND THE GREAT BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-08045

WATER RESOURCES DATA FOR COLORADO, 1974: PART 2. WATER QUALITY RECORDS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-08047

GEOHYDROLOGIC RECONNAISSANCE OF THE IMPERIAL VALLEY, CALIFORNIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-08052

RECORDS OF WELLS, SPRINGS, AND STREAMS IN THE POTOMAC RIVER BASIN, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va.
For primary bibliographic entry see Field 4B.
W76-08055

SURFACE-WATER RESOURCES OF THE TANGIPAHOA, TCHEFUNCTA, AND NATALBANY RIVER BASINS, SOUTHEASTERN LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 4A.
W76-08056

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1975,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W76-08057

SOLUTE TRANSPORT AND MODELING OF WATER QUALITY IN A SMALL STREAM,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-08058

GEOHYDROLOGIC SIGNIFICANE OF LITHOFACIES OF THE CARRIZO SAND OF ARKANSAS, LOUISIANA, AND TEXAS AND THE MERIDIAN SAND OF MISSISSIPPI,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 2F.
W76-08061

MIX2: A COMPUTER PROGRAM FOR MODELING CHEMICAL REACTIONS IN NATURAL WATERS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-08062

ACCUMULATION AND LOSS OF RESIDUES OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) IN FISH MUSCLE TISSUE: LABORATORY STUDIES,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeaster Fish Control Lab.
For primary bibliographic entry see Field 5C.
W76-08065

5B. Sources Of Pollution

EVALUATION OF A SOIL NITRATE TRANSPORT MODEL,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics.
M. F. Walter, T. S. Steenhuis, G. D. Bubenzer, and J. C. Converse.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois 5 fig, 8 tab, 10 ref. OWRT-B-076-WIS(5).

Descriptors: *Model studies, *Nitrates, *Soil water movement, Groundwater, Pollutants, Leaching, *Farm wastes, Groundwater movement, *Water pollution sources, Dairy industry, Liquid wastes, Coarse sediments, Sands, Silts.

The potential for groundwater pollution from heavy land applications of dairy manure is a growing concern because manure is being concentrated in smaller areas. The worst conditions in terms of nitrate leaching to the groundwater occur on coarse textured soils in early spring. A computer model was developed specifically for heavy spring application of liquid dairy manure on coarse soils. The model was used to predict nitrate movement from the application of manure on experimental plots on a Plainfield sand and in a Plano silt loam soil column. The computer model was designed to estimate, for specified intervals of soil depth and time after manure application, the delay to initial nitrification of manurial ammonium, ammonium nitrification rate, soil organic nitrogen mineralization rate, nitrate dispersion, nitrate and ammonium content and soil moisture. Precipitation and temperature data, date of manure application, ammonium concentration of liquid manure, and quantity of manure applied must be specified for each particular case. When the model properly simulates nitrate movement through a soil, the results are no better than the input weather data. The model depends on interrelationship between temperature and effective precipitation over a period of several weeks or months. Input weather data should be based on the probability of a sequence of particular weather conditions occurring. (Skogerboe-Colorado State)
W76-07453

CHESAPEAKE BAY RADIOACTIVE TRACER STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
A. R. Tool.
Miscellaneous Paper H-76-1, January 1976. 34 p, 4 fig, 1 tab, 9 pl, 15 ref, append.

Descriptors: *Chesapeake Bay, *Radioactivity techniques, *Tracers, *Path of pollutants, Tides, Bays, Waste disposal, *Maryland, Pollutant identification.
Identifiers: *Dredged material, *Tidal currents, Pooles Island(Md).

A radioactive tracer study was conducted in the Chesapeake Bay near the Pooles Island Deep disposal area to obtain qualitative information concerning movement of dredged material placed in the area. Approximately 15 curies of gold(198) was mixed with a sediment sample and placed on the bottom of the Bay. Daily tracings of the labeled sediment revealed movement along a narrow band in the general direction of the tidal currents. Movement in the direction of flood flow was determined to be much greater than that in the direction of ebb flow. (WES)
W76-07460

A STUDY OF THE FAUNA IN DREDGED CANALS OF COASTAL LOUISIANA,
Louisiana Wildlife and Fisheries Commission, New Orleans.
For primary bibliographic entry see Field 5C.
W76-07486

FACTORS AFFECTING WATER QUALITY FROM STRIP-MINED SITES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
J. F. Connell, D. N. Contractor, and V. O. Shanholtz.
Virginia Water Resources Research Center, Blacksburg, VWRRC Bulletin 87, March 1976, 75 p. 18 tab, 18 fig, 19 ref.

Descriptors: Water quality, *Mine drainage, Strip-mines, Watershed management, Model studies, Linear programming, Oxidation, Forecasting, *West Virginia, *Path of pollutants, Drainage.
Identifiers: *Strip-mine drainage, Mine runoff, Pyrite oxidation.

This project analyzed the parameters that influence the quality of water from stripmined sites. An instrumented watershed near Beckley, W. Va. provided data on precipitation, stream flow, and water quality, both before and during mining operations. The data were analyzed to derive linear relationships between a water-quality parameter and such variables as temperature, current and antecedent precipitation, and the extent of the area disturbed by mining. Mathematical formulae representing sulfate and calcium concentration, alkalinity, turbidity, conductance, and discharge were used in the study. A correlation analysis also was made among the various water-quality parameters. A formula in each water-quality parameter was derived for each of three conditions: (1) before mining; (2) during mining for the disturbed area alone, and (3) during mining for the entire watershed. The coefficients in the formulae then were refined for minimum error. The coefficients indicate that temperature is not an important water-quality consideration except in the case of alkalinity. The coefficients of the antecedent precipitation terms indicate that, in most cases, surface runoff isthe basic mechanism by which the substances affecting water quality are conveyed from the disturbed area into a receiving stream. The findings provide data that can be used in the future for predicting water-quality impacts from strip-mining operations at particular sites in the study area.
W76-07582

QUALITY AND QUANTITY OF NONPOINT POLLUTION SOURCES IN RURAL SURFACE WATER RUNOFF ON OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
S. K. Yim, and G. L. Dugan.
Available from the National Technical Information Service, Springfield, Va 22161, as PB- 252 765, $4.50 in paper copy, $2.25 in microfiche. Technical Report No. 93, June 1975. 60 p, 17 fig, 15 tab, 42 ref. OWRT A-044-HI (1) 14-31-0001-5011.

Descriptors: *Eutrophication, *Nutrients, *Rural areas, *Sediment, Water quality, Surface runoff, Nitrogen, Phosphorus, *Hawaii, Water pollution sources, Agricultural runoff, Sampling, Chemical oxygen demand, Storm runoff.
Identifiers: Tipping bucket, Forest runoff, *Nonpoint pollution sources.

The quality and quantity of rural runoff was the subject of a field study conducted on the island of Oahu. The study investigated surface water runoff from three rural land uses: an undeveloped forested area, a sugarcane field, and a pineapple field. A 37.85-l (10-gal) tipping bucket sampler was used to collect composited runoff samples at each site and to record the volume of runoff associated with each sample. The results show that storm water runoff from undeveloped areas is the major contributor of nutrient, COD, and sediment, into wet weather streamflow. Furthermore, nutrients and COD in this type of runoff are primarily in sediment-associated forms. The sugarcane field samples included storm runoff and irrigation tailwater. Cane field runoff in central Kunia was lower in most water quality parameters than the forest runoff in Manoa. Insufficient samples due to dry weather prohibited a thorough analysis of pineapple field runoff.
W76-07583

EFFECTS OF CAGE CULTURE OF CATFISH UPON WATER QUALITY IN RESERVOIRS,
Clemson Univ., S. C. Dept. of Entomology.
H. A. Loyacano, Jr., and A. M. Burch.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-252 766, $3.50 paper copy, $2.25 in microfiche. South Carolina Water Resources Research Institute, Clemson. (1976) Report 61, 12 p, 2 tab, 18 ref. OWRT B-033-SC (1)

Descriptors: *Water quality, *Aquiculture, *South Carolina, Catfishes, Reservoir, Lakes, *Monitoring, Water pollution sources, Water pollution effects.
Identifiers: *Catfish cage culture, Thermal effluents, Lake Keowee(SC), Lake Hartwell(SC).

Water quality was monitored in Lakes Keowee and Hartwell, South Carolina, at sites proximal to cages and at control sites before, during, and after periods when catfish were fed in the cages. Parameters measured were alkalinity, carbon dioxide, dissolved oxygen, nitrate nitrogen, orthophosphate, temperature, and turbidity in both lakes; total phosphate, total hardness, and ammonia nitrogen in Lake Hartwell only; and Secchi-disk transparency in Lake Keowee only. Water quality was not significantly different between cage and control sites.
W76-07585

STREAM BOTTOM ORGANISMS AS INDICATORS OF ECOLOGICAL CHANGE: PHASE II,
Lamar Univ., Beaumont, Tex. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-07586

HYDROLOGIC CHARACTERISTICS OF LAGOONS AT SAN JUAN, PUERTO RICO, DURING A JANUARY 1974 TIDAL CYCLE,
Geological Survey, Fort Buchanan, Puerto Rico.
S. R. Ellis, and F. Gomez-Gomez.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 972, $4.50 printed copy; $2.25 microfiche. Water-Resources Investigations 38-75, January 1976. 45 p, 28 fig, 8 tab, 8 ref.

Descriptors: *Tidal effects, *Lagoons, *Water quality, *Flow rates, *Puerto Rico, Data collections, Hydrologic properties, Salinity, Sewage effluents, Urban runoff, Industrial wastes, Canals, Surface waters, *Path of pollutants.
Identifiers: *San Juan(P R), Tidal cycle effects.

The lagoons in the San Juan area, Puerto Rico consist of Laguna La Torrecilla, Laguna de Pinones, Laguna San Jose, and Laguna del Condado. They are interconnected by canals, except for Laguna del Condado, which is connected to the other lagoons by way of Bahia de San Juan. The lagoons contain saline to brackish water, raw and partly treated sewage, urban runoff, and industrial effluents. Flows were measured and water-quality was sampled hourly for a tidal cycle (25 hours) in January 1974 at each connecting canal and outlet to the ocean. Interlagoon and ocean-lagoon flows, total organic carbon, total phosphorus, total orthophosphate, and suspended-sediment loads were calculated for a tidal cycle. Combined outflows of the Rio Puerto Nuevo and Cano de Martin Pena were calculated for the Cano de Martin Pena at the Constitution Bridge site. (Woodard-USGS)
W76-07597

AQUIFER TESTS IN THE SUMMIT REACH OF THE PROPOSED CROSS-FLORIDA BARGE CANAL NEAR OCALA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W76-07599

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, MAY 1974,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5A.
W76-07606

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, AUGUST 1974, AND CHEMICAL MONITORING FROM JULY 1972 TO JUNE 1974,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5A.
W76-07607

POLLUTANTS 'FINGERPRINTED' BY RADIOACTIVE METHOD.
For primary bibliographic entry see Field 5A.
W76-07629

LABORATORY MODEL STUDY OF THE EFFECTS ON THE AQUATIC MICROFLORA OF COAL-WASHING PLANT-GENERATED WASTE WATERS (SZENMOSO-UZEMI SZENNYVIZEK ELOVIZEKRE GYAKOROLT HATASNAK LABORATORIUMI MODELLVIZSGALATA),
J. Gellen, and J. Kenyeres.
Banyaszati es Kohaszati Lapok-Banyaszat, Vol. 106, No. 8, p 540-545, 1973. 13 fig, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Environmental effects, Aquatic plants, Aquatic microorganisms, Model studies, Chemical oxygen demand, *Activated sludge.
Identifiers: Coal-washing wastes, Microflora.

The effect of coal-washing plant-generated waste water on aquatic microflora was studied in a model experiment, using phenol-adapted activated sludge for aquatic microflora, hard coal slurry for effluent, and sodium chloride for modeling salt loads. The relevancy of the COD value, determined by means of the strong oxidizing agent potassium dichromate, for the evaluation of the biologic oxidizability of coal-washing plant-generated effluents, was also investigated. Findings indicated that hard coal slurries are readily oxidizable chemically, but have negligible BOD5 values. Inhibition of the activated sludge, and considerable reduction in the oxygen content of the system were found to occur only at extreme salt concentrations and pH values that are most unlikely to occur in practice. It was concluded that the biologic oxidizability of coal-washing plant-generated waste water, and consequently the treatment fees to be paid by coal-washing plants, should not be determined from the unrealistically high COD values obtained by the potassium dichromate method. (Takacs-FIRL)
W76-07641

PROBLEMS RELATED TO THE RENEWED GROUNDWATER LEVEL RISE IN PREVIOUS MINING AREAS AS ILLUSTRATED BY THE SOUTHERN LUSATIA EXAMPLE (PROBLEME DES GRUNDWASSERWIEDERANSTIEGS IN EHEMRLIGEN BERGBAUGEBIETEN AM BEISPIEL DER SUED-LAUSITZ),
K-F. Busch, J. Quast, and L. Luckner.
Wissenschaftliche Zeitschrift der Technischen Universitaet Dresden, Vol. 22, No. 4, p 660-663, 1973. 1 fig, 11 ref.

Descriptors: *Groundwater, *Water management(Applied), Mine water, Mining, Computers, *Model studies, Environmental effects, Europe, Water pollution sources, Forecasting.
Identifiers: Groundwater level rise.

A territory-specific electro-analog model for the forecasting of the renewed groundwater level rise in abandoned surface mines was described, using the example of the Southern Lusatia surface mines. The simulation of the renewed groundwater level rise requires highly precise calculations for regional groundwater flow problems, and exact use of representative system parameters such as permeability and storage coefficients, as well as the location and effectiveness of the recipients, and the rate of groundwater formation. Problems related to the renewed rise of the groundwater levels can be solved by means of analogous electric resistance networks, or numerically by the use of digital computer. Model investigations of the Southern Lusatia surface mining area revealed an initial rapid rise in the groundwater level, followed by subsequent leveling-off due to the interactions between adjacent surface mines. The stationary final state of the groundwater level in abandoned surface mines, without supply from outside sources, is calculated to be reached in 20 to 25 years. Great influence of evaporation on the dynamics of renewed groundwater level rise was established. Model studies of the renewed groundwater level rise in abandoned surface mines are necessary for the planning of the recultivation of such sites and of future water management in such areas. (Takacs-FIRL)
W76-07663

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES, VOLUME III,
Ontario Inst. for Environmental Studies, Toronto.
For primary bibliographic entry see Field 5A.
W76-07676

BIOLOGICAL AVAILABILITY OF MERCURY IN SWORDFISH (XIPHIAS GLADIUS),
Nabisco Research and Development Center, Fair Lawn, N. J.
For primary bibliographic entry see Field 5C.
W76-07694

POLLUTION OF A TASMANIAN RIVER BY MINE EFFLUENTS: I. CHEMICAL EVIDENCE,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
P. A. Tyler, and R. T. Buckney.
Int Rev Gesamten Hydrobiol. 58(6), p 873-883, 1973.

Descriptors: Water pollution sources, Discharge(Water), *Water pollution effects, Industrial wastes, Chemical analysis, *Mine water, Mine drainage, Mine wastes, *Australia, *Acid mine water, Zinc, Cadmium, Copper, Lead, Iron, Manganese, Dusts, Tungsten, *Rivers.
Identifiers: Sulfuric acid, Tasmania, Particulates, South Esk River(Tas).

Discharge of effluents from tin and wolfram mines caused severe pollution of 2 creeks and lesser pollution of the South Esk River in North-East Tasmania. The principal pollutants are sulfuric acid, Zn, Cd, Cu, Pb, Fe and Mn in dissolved or particulate form or both. The creek waters were rendered unsuitable for domestic or agricultural use and all normal biota destroyed. In the South Esk River trout are absent from polluted reaches though abundant elsewhere. Flood-borne mine tailings, rich in particulate pollutants, have destroyed or degraded pastures along the South Esk River. (See also W76-07705)--Copyright 1974, Biological Abstracts, Inc.
W76-07704

POLLUTION OF A TASMANIAN RIVER BY MINE EFFLUENTS: II. DISTRIBUTION OF MACROINVERTEBRATES,
Tasmania Univ., Hobart (Australia). Dept. of Zoology.
V. J. Thorp, and P. S. Lake.
Int Rev Gesamten Hydrobiol. 58(6), p 885-892, 1973.

Descriptors: *Rivers, *Australia, *Water pollution effects, Effluents, Discharge(Water), *Mine water, Cadmium, Resistance, Crustaceans, Mollusks, Annelids, Aquatic animals, Zinc, Cadmium, *Invertebrates.
Identifiers: Arachnida, Hemiptera, Leptocerid trichopterans, South Esk River, Tasmania.

The distribution and abundance of macroinvertebrates were studied in the South Esk River, Tasmania; a river subject to Cd and Zn pollution as a result of mining. The groups most intolerant of Cd-Zn pollution were the Crustacea, Mollusca and Annelida. Highly tolerant groups included aquatic Hemiptera and Arachnida, and larvae of leptocerid trichopterans. A drop in both species diversity and abundance occurred after floods in winter and was probably due to pulses of Cd and Zn down the river and also to increased molar action of the unstable substrate. (See also W76-07704)--Copyright 1974, Biological Abstracts, Inc.
W76-07705

INTENSIFIED FISH CULTURE COMBINING WATER RECONDITIONING WITH POLLUTION ABATEMENT,
Kramer, Chin and Mayo, Seattle, Wash.
For primary bibliographic entry see Field 5G.
W76-07711

STUDIES OF TOLERANCE TO HEAVY METALS IN THE FLORA OF THE RIVERS YSTWYTH AND CLARACH, WALES,
University Coll. of Wales, Aberystwyth. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5C.
W76-07712

DDT RESIDUES IN COD LIVERS FROM THE MARITIME PROVINCES OF CANADA,
Fisheries and Marine Service, Halifax (Nova Scotia). Inspection Branch.
For primary bibliographic entry see Field 5C.
W76-07719

OIL TANKER POLLUTION CONTROL: DESIGN CRITERIA VS EFFECTIVE LIABILITY ASSESSMENT,
Department of the Treasury, Washington, D.C.
For primary bibliographic entry see Field 5G.

W76-07812

NON-POINT POLLUTION IN THE POTOMAC RIVER BASIN,
Interstate Commission on the Potomac River, Bethesda, Md.
R. N. Palmer.
ICPRB Tech. Pub. No. 75-2 (June 1975).

Descriptors: *Potomac River, *Watershed management, *River basins, *Water pollution control, *Water management(Applied), Maryland, West Virginia, Virginia, Pennsylvania, District of Columbia, Water pollution source, Water pollution effects, Water pollution treatment, Water quality, Sediment, Bacteria, Nutrients, Abatement, Chemical reactions, Federal government, State governments, Sewers, Costs, Eutrophication, Pollution, Acid mine water.
Identifiers: *Non-point sources(Pollution), *Potomac River Basin, *Acid mine drainage, Retention basins.

This booklet presents an overview of present non-point pollution problems in the Potomac River Basin, including discussion of the magnitude and effect of various pollution sources and abatement techniques. Non-point source pollution control--control of diffuse pollution sources--presents unique difficulties because of extreme quantity variations; consequently, it is necessary in addition to 'point source' control if water quality in this area is to be improved. There are four major non-point sources of pollution: (1) Acid mine drainage originating from coal mine runoff of which the ultimate pollution impact is area sterility. Abatement techniques are 'prevention' and 'treatment'. (2) Sediment pollution from both urban/suburban and rural areas which results from erosion and acid mine drainage, thereby decreasing the usefulness of water and altering the natural river ecology. Abatement approach is regulation by state and local governments. (3) Bacteria pollution originating from treated and untreated sewage and industrial discharge, storm water runoff and combined sewage overflows. Treatment is by separation of combined sewers and construction of retention basins. (4) Increasing nutrient discharge from municipal, agricultural and forest sources advances eutrophication rate presenting problems of water purification. Control centers around advanced waste treatment of point source discharges. (Hadoulias-Florida)
W76-07820

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07853

ECOLOGICAL OBSERVATIONS ON SIMULIIDAE OF THE ARRONE RIVER AND INFLUENTS OF THE BRACCIANO LAKE, (IN ITALIAN),
For primary bibliographic entry see Field 5C.
W76-07936

THE DISTRIBUTION OF STIGEOCLONIUM TENUE KUTZ. IN SOUTH WALES IN RELATION TO ITS USE AS AN INDICATOR OF ORGANIC POLLUTION,
University Coll. of Wales, Aberystwyth. Dept. of Botany and Microbiology.
R. O. McLean, and K. Benson-Evans.
Br Phycol J. 9(1), p 83-89, 1974.

Descriptors: Rivers, *Algae, Pollutants, Analysis, *Resistance, Organic wastes, *Bioindicators, Pollutant identification, Path of pollutants, Distribution.
Identifiers: *Stigeoclonium-Tenue Kutz, Wales.

The distribution and frequency of S. tenue Kutz. in some South Wales rivers were studied for 12 mo. to assess the value of the alga as an indicator of organic pollution. It colonized organically polluted areas at most times of the year in greater abundance than at cleaner stations. Tolerance was observed over a wide range for a number of environmental factors: pH, water temperature, suspended solids content, flow nitrate, nitrite and ammonia nitrogen, phosphate phosphorus, dissolved oxygen, BOD (biological oxygen demand), electrical conductivity, chloride, total hardness, magnesium hardness and calcium hardness. Greatest tolerance was expressed mainly in the spring months when the organism became widely distributed in diverse habitats ranging from organically polluted to fairly clean conditions. Some precautions in the use of S. tenue as an indicator of organic pollution are suggested. The frequency of the organism should be noted especially in spring, since organic conditions are suspect only when the alga is highly abundant.--Copyright 1974, Biological Abstracts, Inc.
W76-07957

PESTICIDE POLLUTION AND ITS ECOLOGICAL IMPLICATIONS, (IN FRENCH),
Paris-11 Univ., Orsay (France). Laboratoire de Zoologie.
For primary bibliographic entry see Field 5C.
W76-07983

PRELIMINARY NOTE ON THE OBSERVATION OF TERRIGENOUS DRIFTS INTO THE SEA, OBTAINED BY MEANS OF TELEVISED PICTURES TRANSMITTED BY ARTIFICIAL SATELLITES, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
G. Palusi.
Rev Int Oceanogr Med 39/40; p 171-176, 1975.

Descriptors: Remote sensing, Satellites(Artificial), Aerial photography, Industrial wastes, Path of pollutants.
Identifiers: France, Italy, *Mediterranean Sea, Terrigenous drift.

Analysis of high-contrast television pictures of the Mediterranean shore taken by satellites showed terrigenous drifts and industrial pollution. Studies of Cote d'Azure and the Riviera (France, Italy) are presented.--Copyright 1975, Biological Abstracts, Inc.
W76-07992

THE GULF AND THE ESTUARY OF THE SAINT-LAWRENCE RIVER: REVIEW OF THE PRINCIPAL PAPERS ON CHEMICAL OCEANOGRAPHY, (IN FRENCH),
Quebec Univ., Rimouski (Quebec). Dept. of Pure Sciences.
M. Khalil, and M. Arnac.
Rev Int Oceanogr Med 39/40; p 153-170, 1975.

Descriptors: St. Lawrence River, Oceanography, Estuaries, Water circulation, Trace elements, Water pollution sources, Pesticides, Oil wastes.

Intensive biological activities take place in the gulf and estuary of the St. Lawrence River (North America). The water circulation at the basis of any chemical or geochemical study is relatively well known. The composition of the particulate suspended matter in the estuary is richer in trace elements compared to the concentrations of the latter in the earth crust. Major constituents of surface waters collected in the Gaspe current seem to be of the same order of magnitude as the published data for sea-water. The concentrations of trace metals in the estuary and its effluent are of the same order. Where comparision is possible these values for the estuary are generally higher than those for the gulf. Contamination by organochlorine pesticides is not high. Petroleum residue concentrations are not yet at harmful levels.--Copyright 1975, Biological Abstracts, Inc.
W76-07993

POLLUTION OF THE RUNOFF IN SEPARATE SEWER SYSTEMS, AND MEASURES FOR THE REDUCTION OF RAINWATER RUNOFF-GENERATED POLLUTION OF WATER BODIES (DIE VERSCHMUTZUNG DES ABFLUSSES IM TRENNVERFAHREN SOWIE MASSNAHMEN ZUR VERMINDERUNG DER GEWAESSERVERSCHMUTZUNG INFOLGE REGENWASSEREINLEITUNGEN),
P. G. Brunner.
Gas-Wasser-Abwasser, Vol. 53, No. 4, p 109-113, May, 1973. 6 tab, 8 ref.

Descriptors: *Storm runoff, *Sewerage, Pollution abatement, Biochemical oxygen demand, Chemical oxygen demand, Nitrogen, Storm water, Retention, Phosphates, Air pollution, Sewers, Cleaning, Retention, Rainfall-runoff relationships.
Identifiers: Orthophosphate.

Storm runoff pollution measurement in sewer systems conducted in Cincinnati, Ohio; Tulsa, Oklahoma; Ann Arbor, Michigan; and in Oxhey, England, as well as measures for pollution abatement of water bodies have been investigated. The filtrable matter content and dissolved solids content of the rainfall runoff in Tulsa ranged from 84 to 2052 mg/liter and from 89 to 400 mg/liter, respectively. The BOD5 and COD values of the runoff in the four cities were in the ranges of 8-28 mg/liter and 42-138 mg/liter. The soluble orthophosphate content and the organic nitrogen content average 0.54-3.49 mg/liter and 0.36-2.10 mg/liter. This runoff pollutant load can be effectively reduced by intensified street clean-up, especially in March and April, and by global air pollution abatement. A Cincinnati experiment with storm water retention for 10 to 20 minutes in a retention basin gave results concerning (mediocre) pollutional load abatement, (no) effect on bacteria count, and (fairly high) investment and operating costs. The rates of reduction in the BOD5 value, the organic nitrogen, and total phosphate contents achieved after retention of 20 minutes in the four systems were 15, 33, 25, and 8 percent. (Sandoski-FIRL)
W76-07997

POLLUTION OF WATER BODIES BY ARTIFICIAL RUNOFF OF RAINWATER POLLUTION BY WASTE WATER OF MIXED SEWERS (BELASTUNG DER GEWAESSER DURCH KUENSTLICHE ABLEITUNG VON NIEDERSCHLAEGEN. BELASTUNG DURCH ABWAESSER DER MISCHKANALISATION),
K. Krauth.
Berichte der Abwassertechnischen Vereinigung E. V., No. 25, p 97-115, 1973. 5 fig, 11 tab, 11 ref.

Descriptors: *Sewerage, *Storm runoff, Combined sewers, Treatment facilities, Rainfall-runoff relationships, Water storage.
Identifiers: Rain storage basins.

In a two-year test series conducted in West Germany, runoff conditions specifically related to mixed sewer systems were determined during rainfall periods. Quantitative measurements were taken for 621 storm runoff periods with intensities greater than 7 cu ft/sec. Samples were taken of such short intervals that evaluation of the dirt load was feasible. Primary runoffs which flushed entire sewer systems, runoffs which succeeded primary runoffs, and runoffs which partly flushed the sewers, were considered. The results indicate that only temporary storage of the storm runoff and its subsequent purification help to reduce the dirt load. For maintaining a dirt load consistent with that occurring during dry weather, no water may pass the rain storage basin after it has been filled. Under present conditions the dry weather runoff goes directly to the purification plant and the

storm runoff directly to the receiving stream without treatment. (Nave-FIRL)
W76-08009

DATA TRANSMISSION SYSTEM MONITORS RIVER POLLUTION.
For primary bibliographic entry see Field 5A.
W76-08028

STORM DRAINAGE 'FILTERED' BEFORE DISCHARGE,
For primary bibliographic entry see Field 5G.
W76-08032

AN EVALUATION OF THE POTENTIAL FOR ECOLOGICAL DAMAGE BY CHRONIC LOW-LEVEL ENVIRONMENTAL POLLUTION BY FLUORIDE,
California Inst. of Tech., Pasadena. Div. of Humanities and Social Sciences.
For primary bibliographic entry see Field 5C.
W76-08038

A STUDY OF THE MARINE RESOURCES OF HINGHAM BAY,
For primary bibliographic entry see Field 5C.
W76-08039

ARTIFICIAL RECHARGE THROUGH A WELL IN FISSURED CARBONATE ROCK, WEST ST. PAUL, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4B.
W76-08046

EVALUATION OF GROUND-WATER CONTAMINATION FROM CLEANING EXPLOSIVE-PROJECTILE CASINGS AT THE BANGOR ANNEX, KITSAP COUNTY, WASHINGTON, PHASE II,
Geological Survey, Tacoma, Wash.
J. V. Tracy, and N. P. Dion.
Water-Resources Investigations 62-75 (open-file report), 1976. 44 p, 8 fig, 3 tab, 13 ref.

Descriptors: *Water pollution sources, *Groundwater, *Waste disposal, *Military reservations, *Washington, Explosives, Leaching, Path of pollutants, Sampling, Water wells, Water analysis, Evaluation, Aquifer characteristics, Public health.
Identifiers: U.S. Navy Bangor Annex(Wash), *Projectile casings waste, TNT, RDX.

From 1966 through 1970 the U.S. Navy steam cleaned explosive-projectile casings at the Bangor Annex, Washington. The condensed waste water, containing explosive residuals, was channeled to a shallow, unlined disposal pit. The waste water recharges a shallow aquifer used for domestic water supplies. Prolonged exposure to the resources reportedly can cause deleterious physiological effects on humans. The Navy obtained the U.S. Geological Survey to make a study of the groundwater conditions. The extent of the contamination of both the groundwater and the earth materials is local, although the earth materials will provide a source of low-level contamination of percolating groundwater for many years. The estimates of TNT and RDX in the earth materials in the disposal pit indicate that very little RDX (300 pounds, 140 kg) remains in the materials and the TNT (9,500 pounds, 4,300 kg) appears to be well adsorbed on the clayey materials. Percolation of rain water over a period of years may slowly leach out the remaining TNT and RDX, but the concentrations of these leachates is not expected to be significantly different from those that currently exist in the groundwater under the disposal area. (Woodard-USGS)
W76-08048

SOLUTE TRANSPORT AND MODELING OF WATER QUALITY IN A SMALL STREAM,
Geological Survey, Menlo Park, Calif.
S. M. Zand, V. C. Kennedy, G. W. Zellweger, and R. J. Avanzino.
Journal of Research of the U. S. Geological Survey, Vol 4, No 2, p 233-240, March-April 1976. 8 fig, 2 tab, 9 ref.

Descriptors: *Path of pollutants, *Tracking techniques, *Water quality, *Streams, Small watersheds, Data collections, Mathematical models, Chlorides, Sodium, Methodology, Analytical techniques.
Identifiers: *Stable strontium, Mass transport.

An injection of chloride, sodium, and stable strontium was made at a constant rate for 3 hours into Uvas Creek, Santa Clara County, Calif., to determine the mass transport processes in a small stream. Five observation points were selected within a 610-meter reach of the stream below the injection site. Water samples were collected at the observation points during and immediately after the injection. A mathematical model of the stream was obtained by solving analytically and optimally the one-dimensional mass transport equation of the solutes in the stream. Comparison of field results with a simplified mathematical model indicates the dominance of convection in the behavior of sodium and chloride. The concentration of chloride and sodium can be closely simulated by the model. However, strontium cannot be well represented by the simplified model, which contains a first-order decay-type sink. (Woodard-USGS)
W76-08058

MIX2: A COMPUTER PROGRAM FOR MODELING CHEMICAL REACTIONS IN NATURAL WATERS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-08062

IMPORTANCE OF WATER QUALITY IN THE USE OF LARGE VOLUMES OF WATER FOR CONDENSER COOLING IN POWER STATIONS,
Bhabha Atomic Research Centre, Bombay (India). Chemistry Div.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 4, p 124-127, April 1975. 2 tab, 5 ref.

Descriptors: *Water quality, *Powerplants, *Condensers, *Cooling, *Thermal pollution, *Water chemistry, Lakes, Rivers, Effects, Nuclear powerplants, Water sampling.
Identifiers: Impurities, Langelier method.

An important feature of a power station is the condenser which is used to condense steam coming out of the turbine. The obvious choice of a coolant for condenser cooling is water; depending on the location of the power station, it can be lake water, river water, or even sea water. For example at the nuclear power stations in India, sea water is used at TAPS and MAPP, while impounded Chambal water from Rana Pratap Sagar dam is used at RAPS. Furthermore, for economic reasons, Pallar river water is proposed for condensor cooling in the fast breeder test reactor coming up at Kalpakkam, even though it is situated on the coast. When lake or river waters are used, apart from the fact that an abundant supply of coolant is assured throughout the year due to geographical and climatic conditions, the other main criteria are the quality of the coolant water and the cost of maintaining the required quality. This paper considers the importance of water quality in condenser cooling and discusses the use of river and lake water. Considered are impurities in water, the effect of impurities, chemical aspects, and other aspects. In view of the fact that nuclear power stations will play a larger role in coming years, the availability of good quality water at inland locations for condenser and other system cooling has to be studied from all angles. (Bell-Cornell)
W76-08070

EQUITY CONSIDERATIONS IN CONTROLLING NONPOINT POLLUTION FROM AGRICULTURAL SOURCES,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-08094

5C. Effects Of Pollution

THE PLIGHT OF THE URBAN RESERVOIR: A CASE STUDY,
Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst.
T. J. Tuffey, and H. Baker.
Water Resources Bulletin, Vol. 11, No. 3, p 575-583, June 1975. 4 fig, 14 ref. OWRT A-043-NJ(1).

Descriptors: *Reservoirs, *Water quality, *Land use, Eutrophication, Phosphorus, Recreation, *New Jersey, Water pollution effects.
Identifiers: *Spruce Run Reservoir(NJ).

This paper details the increasing tendency to overdevelop lands adjacent to public reservoirs. The impact on water quality of the pollutant load carried in surface runoff from developed lands is described, as well as the depreciation in recreational experience due to loss of scenic horizons. The case study, Spruce Run Reservoir in Clinton, New Jersey, included population and demand projection. Land speculation and proposed development are evaluated on a physical constraint basis. Areas of conflict are outlined and conflict resolutions proposed. (Bell-Cornell)
W76-07452

THE ECOLOGICAL BEHAVIOR OF PLUTONIUM AND AMERICIUM IN A FRESHWATER ECOSYSTEM: PHASE II, IMPLICATIONS OF DIFFERENCES IN TRANSURANIC ISOTOPIC RATIOS,
Battelle-Pacific Northwest Labs., Richland, Wash.
R. M. Emery, and T. R. Garland.
Available from the National Technical Information Service, Springfield, Va 22161 as BNWL-1879. $4.00 in paper copy, $2.25 in microfiche. BNWL-1879, December 1974. 26 p, 7 fig, 1 tab, 8 ref. AT(45-1):1830.

Descriptors: *Environmental effects pollution, Radioactivity effects, *Plutonium, *Americium, Freshwater, Waste water(Pollution), Radioisotopes, Ecosystems.
Identifiers: *Transuranics, Ecological behavior.

Transuranics discharged into a freshwater processing waste pond created a complex combination of source terms and isotopic ratios. Relatively large amounts of U238 were released into the pond and, along with unidentified levels of Th232 and Th228 create a problem of interpreting the ecological behavior of Pu and Am in the ecosystem. Ratios of Pu238 to Pu239, Pu240 found in the pond are higher than those in the processing wastewaters released to the pond. Ratios of Pu238 to Pu239, Pu240 and Am241 to Pu239, Pu240 are higher in the pond biota than in the sediments. To a lesser degree ratios of Am241 to Pu238 in the pond biota are also different. The data suggests that sediments in a trench carrying the processing wastes to the pond may be the primary source of Pu and Am. (Chilton-ORNL)
W76-07480

ABUNDANCE, DIVERSITY AND SEASONALITY OF FISHES IN COLORADO LAGOON, ALAMITOS BAY, CALIFORNIA,
California State Univ., Fullerton. Dept. of Biology.
L. G. Allen, and M. H. Horn.
Estuarine and Coastal Marine Science, p 371-380, 1975, Vol 3, 6 fig, 1 tab, 27 ref.

Descriptors: *Fish, Populations, Seasonal, On-site investigations, Temperature, *California, Bays, Seasonal, Lagoons, Killifishes.
Identifiers: Abundance, Diversity, Anchovy, Topsmelt, Shiner surfperch, Staghorn sculpin, California killifish.

The numbers of both fish species and individuals in Colorado Lagoon were highest from May to September and were highly correlated with lagoon temperature which ranged from 12.8 - 25.0 degrees C. 99% of the catch was made up of only four species, northern anchovy, topsmelt, slough anchovy and shiner surfperch. Five species, topsmelt, shiner surfperch, California killifish, staghorn sculpin, and slough anchovy, occurred in wide size ranges and during most of the year and were considered to be residents. Juveniles of northern anchovy were abundant in August and September. (Chilton-ORNL)
W76-07482

THE EFFECT OF DIFFERENT LEVELS OF DIETARY FAT ON THE GROWTH OF RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON),
Stockport Technical Coll., Cheshire (England).
W. D. Atherton.
Journal of Fish Biology, Vol 7, p 565-571, 1975, 4 tab, 29 ref.

Descriptors: *Fish diets, *Growth rates, Feeds, Lipids, *Rainbow trout, Laboratory tests.

Cod liver oil and lard were added to the diet of rainbow trout to investigate the level which would promote the greatest growth at selected temperatures of 12, 16, and 20 degrees C. Data indicated no significant changes in growth rates of fish fed lard at any of the selected temperatures. Levels of 15% or more of cod liver oil added to the diet had an adverse effect on fish at 12 and 16 degrees C. Cod liver oil added at levels of 5 and 10% promoted growth at these temperatures and all fish were affected adversely at 20 degrees C suggesting that the effects were due to temperature rather than dietary factors. (Chilton-ORNL)
W76-07483

A COMPARISON OF THE EFFECTS OF TEMPERATURE ON WOUND HEALING IN A TROPICAL AND A TEMPERATE TELEOST,
Stirling Univ. (Scotland). Unit of Aquatic Pathobiology.
C. D. Anderson, and R. J. Roberts.
Journal of Fish Biology, Vol. 7, p 173-182, 1975, 2 fig, 1 tab, 3 plates, 15 ref.

Descriptors: *Fish, *Laboratory tests, Minnows, Salmon, Temperature, *Teleosts, Thermal effects, *Thermal pollution, Water pollution effect.
Identifiers: Wounds, Healing.

The rate of healing of surgical wounds involving both integument and muscle was studied in two teleost fish. The species chosen were the white mountain cloud minnow (Tanichthyes albonubes) which is a tropical cyprinid and the Atlantic salmon (Salmo salar) which is a temperate anadromous species. Comparisons were made of the rate and quality of wound healing within and between species at temperatures of 5, 10, 23, and 30 degrees C. The rate of wound healing at the tested temperatures increased with increasing temperatures while temperature stress had little effect on the healing rates. (Chilton-ORNL)
W76-07484

THE INFLUENCE OF VARIOUS CULTURE CONDITIONS ON THE OXYGEN CONSUMPTION OF CHANNEL CATFISH,
Georgia Agricultural Experiment Station, Savannah; and Skidaway Inst. of Oceanography, Savannah, Ga.
J. W. Andrews, and Y. Matsuda.
Transactions of the American Fisheries Society, Vol. 104, No. 2, p 322-327, 1975, 3 fig, 26 ref.

Descriptors: *Oxygen requirements, *Fish, *Channel catfish, Environment, Temperature, Weight, Dissolved oxygen, Laboratory tests.
Identifiers: *Oxygen consumption(Fish), Feeding(Fish).

Relationships between oxygen consumption of channel catfish and environmental dissolved oxygen concentrations, feeding status, weight of fish, and temperature were investigated. The rate of oxygen depletion in a still tank with no aeration was used to estimate oxygen consumption. At oxygen concentrations between 1 and 7 milligrams/liter a decrease in oxygen consumption rate with a decrease in environmental oxygen concentration was noted. The highest oxygen consumption rates were obtained one hour after feeding. The relationship between oxygen consumption and environmental temperature was linear over the range of 24-28 degrees C for well-fed fish and 24-30 degrees C for fasted fish. (Chilton-ORNL)
W76-07485

A STUDY OF THE FAUNA IN DREDGED CANALS OF COASTAL LOUISIANA,
Louisiana Wildlife and Fisheries Commission, New Orleans.
G. Adkins, and P. Bowman.
Technical Publication No. 18, February 1976, 72 p, 26 fig, 24 tab, 68 ref.

Descriptors: *Wildlife, *Coasts, *Louisiana, Wetlands, Environment, Dredging, Canals, Salinity, Temperature, Dissolved oxygen, Foods, Freshwater, Sea water, Water chemistry.

Investigations of biological and hydrological parameters associated with artificial wetlands were made in four environments: open, unaltered areas; open canals; semi-open canals; and closed canals. 67,560 individuals representing 88 species were collected. Open, undisturbed areas offered the largest numbers of individuals and closed canals contained the fewest, although organisms in closed canals were larger in size. Salinity ranged from 30.0 to 0.1 parts per thousand, temperatures from 3.6 to 33.9 degrees C. Hydrological conditions were more stable in closed canals than in any of the other environments. Dissolved oxygen remained within tolerance limits of marine organisms during most of the study although some fish kills were seen in semi-open and closed canals. Water chemistry showed a trend of fluctuation dependent upon fresh water and salt water intrusion. Peak levels of nutrients were found after freshwater flooding conditions or storm surges. (Chilton-ORNL)
W76-07486

FISHERIES AND ENERGY PRODUCTION: A SYMPOSIUM,
1975, Lexington Books, D. C. Heath and Company, Lexington, Massachusetts, 237 p, Saila, S. B. Editor.

Descriptors: *Entrainment, *Model studies, *Nuclear energy, Thermal pollution, Water pollution effects, *Fish, Fish eggs, *Larvae, Stress, Monitoring, Laboratory tests, On-site collections.

Ten papers on the subject of entrainment of fish and fish larvae are included. These include overviews on entrainment, field studies and laboratory studies on mechanical stresses, environmental monitoring, preference and avoidance temperatures as related to established standards, bypasses and electrical barrier systems. (See W76-07488 thru W76-07497) (Chilton-ORNL)
W76-07487

SIMULATING THE IMPACT OF THE ENTRAINMENT OF WINTER FLOUNDER LARVAE,
Rhode Island Univ., Kingston. Marine Experiment Station.
For primary bibliographic entry see Field 8I.
W76-07488

SOME COMMENTS ON THE THERMAL EFFECTS OF POWER PLANTS ON FISH EGGS AND LARVAE,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
J. R. Schubel.
In: Fisheries and Energy Production: A Symposium, p 31-54, 1975, 3 fig, 1 tab, 50 ref.

Descriptors: *Thermal pollution, *Water pollution effects, *Entrainment, Fish eggs, Larvae, Stress.

An assessment is made from laboratory studies in which appropriate time-temperature histories have been used and from field studies at operating plants. Actual time-temperature histories depend upon plant design and the characteristics of the receiving waters. Site studies failed to establish the cumulative effects of pressure changes, mechanical agitation and other stresses to which organisms are subjected when carried through steam electric stations with once-through cooling systems. Data from laboratory studies which have been specifically directed at entrainment questions show that blueback herring, alewife, American shad, and striped bass eggs were able to survive exposure to typical time-excess temperature histories of at least 10 degrees C without any harmful effects. Larvae were generally able to withstand temperature increases of 12 degrees C above acclimation temperatures of 5 to 15 degrees C for 40 minutes without significant increases in mortality. (See also W76-07487) (Chilton-ORNL)
W76-07489

ENVIRONMENTAL MONITORING THROUGH THE USE OF EXPOSURE PANELS,
William F. Clapp Labs., Inc., Duxbury, Mass.
For primary bibliographic entry see Field 5A.
W76-07490

THE MECHANICAL EFFECTS OF WATER FLOW ON FISH EGGS AND LARVAE,
Maryland Univ., Solomons, Md. Chesapeake Biological Lab.
For primary bibliographic entry see Field 8I.
W76-07491

ENTRAINMENT OF ORGANISMS AT POWER PLANTS, WITH EMPHASIS ON FISHES - AN OVERVIEW,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
B. C. Marcy, Jr.
In: Fisheries and Energy Production: A Symposium, p 89-106, 1975 1 tab, 42 ref.

Descriptors: *Entrainment, *Fish, *Powerplants, Fish eggs, Larvae, Environmental effects, Thermal effects, Stress, Intakes.

Available information on entrainment, including the components of inner-plant mortality such as thermal, mechanical and biocidal effects are discussed. Suggestions for reducing entrainment losses are presented. These include siting in nonproductive areas, coordinating plant activities with organism densities, or going to closed cooling systems. The only immediately effective approach to minimize the adverse effect on entrained organisms is believed to be the lower intake volume concept. (See also W76-07487) (Chilton-ORNL)
W76-07492

THE ASSESSMENT OF IMPACT DUE TO ENTRAINMENT OF ICHTHYOPLANKTON,
Stone and Webster Engineering Corp., Boston, Mass. Environmental Engineering Div.
T. J. Horst.
In: Fisheries and Energy Production: A Symposium, p 107-118, 1975. 21 ref.

Descriptors: *Entrainment, *Environmental effects, *Plankton, Fish eggs, Larvae, Populations, Ecosystems, Model studies.

Three approaches to impact assessment are presented. The organism approach estimates the probability of mortality for those organisms which are entrained. The population approach is the impact to fish populations which have egg and larvae stages entrained. The ecosystem approach considers the impact of entrainment to the whole community. The population approach offers the best promise for impact assessment, because models are available which are generally accepted and the impact can be assessed in terms of a basic biological unit, the species population. (See also W76-07487) (Chilton-ORNL)
W76-07493

LABORATORY AND FIELD TEMPERATURE PREFERENCE AND AVOIDANCE DATA OF FISH RELATED TO THE ESTABLISHMENT OF STANDARDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. R. Stauffer, D. S. Cherry, K. L. Dickson, and J. Cairns Jr.
In: Fisheries and Energy Production: A Symposium. p 119-139, 1975. 8 fig, 29 ref.

Descriptors: *Temperature, *Resistance, *Fish, Laboratory tests, On-site data collections, *Fish behavior, Standards, Thermal pollution.

A relationship was shown between laboratory and field determined temperature preference data for the stoneroller, northern hogsucker, and channel catfish. On the basis of this relationship, temperature responses in situ of the smallmouth bass and spotted bass could be predicted from laboratory data. Temperature preference data of important species indicated that a thermal discharge of 7.7 degrees C higher than ambient temperatures would produce no appreciable harm to maintenance of a viable fish community. The most reasonable approach to establishing thermal standards is to couple temperature preference studies with site specific studies. (See also W76-07487) (Chilton-ORNL)
W76-07494

EXPERIMENTS RELATED TO DIRECTING ATLANTIC SALMON SMOLTS, SAIMO SALAR, AROUND HYDROELECTRIC TURBINES,
Fisheries and Marine Service, Halifax (Nova Scotia). Resource Development Branch.
For primary bibliographic entry see Field 8I.
W76-07495

A LABORATORY STUDY ON THE EFFECTS OF THE EXPOSURE OF SOME ENTRAINABLE HUDSON RIVER BIOTA TO HYDROSTATIC PRESSURE REGIMES CALCULATED FOR THE PROPOSED CORNWALL PUMPED STORAGE PLANT,
New York Univ. Medical Center, N. Y. Inst. of Rehabilitation Medicine.
A. P. Beck, G. V. Poje, and W. T. Waller.
In: Fisheries and Energy Production: A Symposium, p 167-204, 1975. 6 fig, 11 tab, 14 ref.

Descriptors: *Entrainment, *Hydrostatic pressure, Fish, Growth stages, Mortality, Biota, Hudson River.
Identifiers: *Acclimation pressure.

During entrainment, organisms will be exposed to rapid change in velocity shear forces, mechanical buffeting and turbulence as well as to changes in hydrostatic pressure. Based on the current analysis of the pressure regime expected at Cornwall, New York the likelihood of surviving the pressure exposure experienced during entrainment will depend on the life history stage entrained and its acclimation pressure. (See also W76-07487) (Chilton-ORNL)
W76-07496

THE EFFECTS OF TWO ELECTRICAL BARRIERS ON THE ENTRAINMENT OF FISH AT A FRESHWATER NUCLEAR POWER PLANT,
Rhode Island Univ., Kingston. Marine Experiment Station.
For primary bibliographic entry see Field 8I.
W76-07497

PERSISTENCE OF DIQUAT IN THE AQUATIC ENVIRONMENT,
Wisconsin Univ., Madison. Water Resources Center.
G. V. Simsiman, and G. Chester.
Water Research, Vol. 10, p. 105-112, 1975. 4 fig., 3 tab., 28 ref. OWRT B-016-WIS(18), 14-01-001-1567

Descriptors: *Pesticide residues, *Persistence, *Diquat, Halogenated pesticides, Herbicides, Biodegradation, Lake sediments, Adsorption, Aquatic plants, *Wisconsin, Lakes.
Identifiers: Lake Mendota(Wis), Lake Tomahawk(Wis).

Following a series of C14 Diquat labeled experiments in weed-infested and weed-free laboratory systems it was noted that although the herbicide has a short residence time in water, a tendency exists for Diquat to accumulate on sediment surfaces either directly or after sorption by aquatic life. The herbicide is released on decay of tissues and is subsequently bound by the sediment. Montmorillonite-adsorbed Diquat persists for longer periods than kaolinite- or vermiculite-adsorbed Diquat. Microbial Diquat degradation was promoted, apparently by rapid proliferation of microorganisms on the decomposing weeds. The clay mineral content of the predominantly montmorillonite contributed to the strong binding between Diquat and the sediment. Although Diquat is microbially degraded, adsorption by montmorillonite makes it less susceptible to breakdown. The persistence of Diquat added to heavily weed-infested aquatic systems is relatively short. In weed-free experiments, the Lake Mendota sediment adsorbed the herbicide almost completely in seven days and was faster in the anaerobic system than in the aerobic system. Microbial degradation of Diquat was noted by cumulative production of C14 labeled carbon dioxide. The higher degree of Diquat degradation in aerobic sediments is an indication that the microorganisms primarily responsible for Diquat breakdown are aerobes; under anaerobic conditions Diquat degradation is slower. (Auen-Wisconsin).
W76-07546

QUALITY AND QUANTITY OF NONPOINT POLLUTION SOURCES IN RURAL SURFACE WATER RUNOFF ON OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W76-07583

EFFECTS OF CAGE CULTURE OF CATFISH UPON WATER QUALITY IN RESERVOIRS,
Clemson Univ., S. C. Dept. of Entomology.
For primary bibliographic entry see Field 5B.
W76-07585

STREAM BOTTOM ORGANISMS AS INDICATORS OF ECOLOGICAL CHANGE: PHASE II,
Lamar Univ., Beaumont, Tex. Dept. of Biology.
R. C. Harrel, and J. L. Duplechin.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-252 763 $4.50 in paper copy, $2.25 in microfiche. Texas Water Resources Institute, College Station, Completion Report, May, 1976, 49 p, 3 fig, 6 tab, 38 ref. OWRT B-189-TEX(1), 14-31-0001-5116.

Descriptors: *Sewage effluents, Surface runoff, Rice, Irrigation water, Invertebrates, *Bioindicators, *Texas, *Municipal wastes, Benthos, *Bottom organisms, Macrobenthos, *Ecological distribution, Water quality.
Identifiers: Hillebrandt Bayou(Tex.), Limnodrilus hoffmeisteri, Hexagenia limbata.

Effects of municipal sewage effluent, municipal surface runoff, and rice field irrigation water on physicochemical conditions and community structure of benthic macroinvertebrates in Hillebrandt Bayou were studied from September, 1974 to August, 1975. Physicochemical conditions were erratic due to frequent localized precipitation which affected surface runoff and quality and quantity of the sewage discharge. A total of 76 species and 71,178 individuals were collected during the study. Numbers of species per station ranged from 35 to 45. The dominant organism at all stations was Limnodrilus hoffmeisteri. Hexagenia limbata was collected at Station 1, above the sewage outfall, and at Stations 5 through 10. The information theory indices diversity per individual and redundancy, and equitability were used to determine community structure. Annual diversity per individual (d) and equitability (e) decreased at Station 3, located below the sewage outfall, then increased downstream to Station 9 and decreased at Station 10. Annual redundance (R) exhibited the inverse relationship to d and e. On three of six collections d and e decreased at Station 10 due to increased numbers of Hexagenia limbata, a clean water species. Individual collection e values were very erratic. Mathematical indices and physicochemical data alone were not sufficient to evaluate water quality and community stress. However, these data together, correlated with knowledge of the orgaisms, allowed an accurate evaluation. (See also W74-10534)
W76-07586

FISH GROWTH RESPONSE TO MECHANICAL MIXING OF LAKE ARBUCKLE, OKLAHOMA,
Oklahoma Cooperative Fishery Unit, Stillwater.
R. C. Summerfelt, and G. Gebhart.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-252 762 $5.50 in paper copy, $2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1976). 104 p, 12 fig, 44 tab, 28 ref, append, OWRT A-048-OKLA(1), 14-34-0001-6037.

Descriptors: *Reaeration, *Growth rates, Distribution, Drums, Bullheads, Channel catfish, Mixing, Sunfishes, *Oklahoma, Lakes, Fish, Destratification.
Identifiers: *Lake Arbuckle(Okla), *Fish growth, *Mechanical mixing, Gizzard shad.

Fish were sampled from 1973-75 to determine the effect of mechanical mixing of Lake Arbuckle, Oklahoma on the growth rate and depth distribution of gizzard shad, white crappie, freshwater drum, black bullhead and channel catfish. The vertical depth distribution, annual growth rate, instantaneous growth rate, seasonal growth rate and condition factors were determined for the above species. The vertical depth distributions of all species were compressed into the upper water layers by an anoxic hypolimnion during summer stratification and the distributions deepened substantially after fall overturn. No positive conclusions about annual growth rates could be resolved, but it appeared that growth was generally larger in 1974

when the lake was partially mixed than in previous nonmixed years. Seasonal growth rates indicated that generally the major portion of the population growth occurred during the destratified overwinter period rather than the stratified summer period. Condition factors often decreased during the stratified summer interval and increased during the destratified period indicating better fish conditions when the lake was destratified.
W76-07587

COMMUNITY PRODUCTIVITY AND ENERGY FLOW IN AN ENRICHED WARM-WATER STREAM,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
R. L. Vannote, and R. C. Ball.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 023, $6.75 in paper copy, $2.25 in microfiche. Report No. MSU-IWR-TR-72-0027 (Technical Report No. 27), September 1972. 166 p. 23 fig., 18 tab., 196 ref. NIH RG-5345-C3

Descriptors: *Energy transfer, *Productivity, *Streams, *Warm-water fish, *Bass, *Energy loss, *Michigan, Crayfish, Eutrophication, Primary productivity, Periphyton, Photosynthesis, Spawning, Standing crops, Aquatic plants, Biomass, Growth rates, Water circulation, Respiration, Dissolved oxygen, Urbanization, Turbidity, Pollutants, Water temperature.
Identifiers: *Red Cedar River(Mich).

Productivity and energetics in the Red Cedar River, Michigan, a smallmouth bass stream, were studied by tracing energy flow patterns and quantifying energy losses from the primary trophic level through the major prey species (crayfish) to bass. Annual primary, macrophyte, and periphyton productivities and photosynthetic efficiencies were calculated. Crayfish were staple items in bass diets and the dominant form of biota. Energy assimilated by crayfish represented 9.4% of energy available at the primary level (0.00527% of incident light energy). Bass nesting density was 21-25 nests/linear stream mile. Postspawning stream conditions determined year class strength. The average bass standing crop was 14.9 kg/ha. Bass production was 13.6 kg/ha/year, representing 0.00024% of incident light energy and 0.14% of net primary production. Assuming crayfish were the only energy source for bass, harvesting efficiency was 14.6% of annual crayfish production. Due to non-assimilated energy losses and energy diverted for body maintenance, 3.6% of crayfish production was used for bass biomass growth. This ecosystem's complex interactions between photosynthesis, circulation, and total community respiration varied according to season and human impact. Further organic enrichment will depress night oxygen levels to a critical level for the stream biota. (Buchanan-Davidson--Wisconsin).
W76-07608

FRESHWATER BIOLOGY AND POLLUTION ECOLOGY: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Programs Operations.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-242 000, $8.00 in paper copy, $2.25 in microfiche. EOA-430/1-75-005, April 1975. 242 p. 95 fig., 17 tab., 312 ref.

Descriptors: *Freshwater, Biology, *Water pollution, *Ecology, *Training, Aquatic algae, Aquatic animals, Aquatic bacteria, Aquatic fungi, Freshwater fish, Plant groupings, Animal groupings, Biological communities, Zooplankton, Waste water, Organic compounds, Periphyton, Invertebrates, Self-purification, Water quality, Estuaries, Toxicity, Bioassay, On-site investigations, Benthos.
Identifiers: *Training manual.

This manual, covering the broad field of freshwater biology and pollution ecology, was designed as an introductory course for sanitary engineers, aquatic biologists, and others concerned with freshwater pollution studies and abatement programs. It includes teaching outlines on the biology and identification of major plant and animal groups, pollution effects, biological pollution indices, and methods of collecting and analyzing freshwater communities. The first section is devoted to surveys of biota. The components of the aquatic community are reviewed to help the observer recognize common types of organisms found in field, laboratory, and treatment facilities. The aquatic environment, production of excess organic matter, and types of algae, macrophytes, animals, microscopic invertebrates of wastewater treatment plants, zooplankton, macroinvertebrates, fish, and fungi are described. The second section discusses pollution ecology: biological aspects of natural self purification, interpretation of biological data with reference to water quality, effects of pollution on aquatic life, global deterioration and the environmental crisis, toxicity bioassays, biological field methods, stream invertebrate drift, artificial substrates, attached growths (periphyton or aufwuchs), application of biological, data, and use of benthic biota for water quality evaluation. (Buchanan-Davidson--Wisconsin).
W76-07611

INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF PARATHION.
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5G.
W76-07612

TAXONOMIC DIFFICULTIES IN RED TIDE AND PARALYTIC SHELLFISH POISON STUDIES: THE 'TAMARENSIS COMPLEX' OF CONYAULAX,
British Columbia Univ., Vancouver. Inst. of Oceanography.
F. J. R. Taylor.
Environmental Letters, Vol. 9, No. 2, p. 103-119, 1975. 10 fig., 1 tab., 24 ref.

Descriptors: *Systematics, *Red tide, Toxicity, Dinoflagellates, Atlantic ocean, Pacific Ocean, Plant physiology, Plant morphology.
Identifiers: *Gonyaulax, *Gonyaulax tamarensis, Thecal morphology, Gonyaulax excavata, Gonyaulax phoneus, Gonyaulax acatenella, Gonyaulax fratercula, Gonyaulax conjuncta, Gonyaulax catenella, Gonyaulax cohorticula, Gonyaulax series.

At least three species of the dinoflagellate genus Gonyaulax form similar potent neurotoxins, but their recognition is confused. The history of the problem is described. Gonyaulax tamarensis type illustrations contained an apparent reversal of epithecal plates and cultures from the type locality were not toxigenic, thus allocation of toxic populations in the North Atlantic to this species or a variety (var. excavata) is doubtful. The latter was designated as a distinct species, but given the wrong name (G. excavata) instead of G. phoneus. Criteria for recognizing other similar species are summarized. Variability in plate patterns observed in cultures of G. tamarensis var. excavata from British Columbia is demonstrated, and its bearing on Gonyaulax taxonomy is discussed. Finding this toxic variety on the west coast of North America is new. Emphasis should not be placed on small differences in shape or size of certain plates unless little variability is observed. Studies are needed on species distribution, variability thecal morphology, and physiological properties. At least three toxic taxa appear on the west coast. Toxic populations of G. tamarensis appear to be var. excavata. If it is a distinct species, it should not be identified as G. excavata but as G. phoneus. (Buchanan-Davidson--Wisconsin).
W76-07614

THE 1971 RED TIDE AND ITS IMPACT ON CERTAIN REEF COMMUNITIES IN THE MID-EASTERN GULF OF MEXICO,
Florida Dept. of Natural Resources, St. Petersburg, Marine Research Lab.
G. B. Smith.
Environmental Letters, Vol. 9, No. 2, p. 141-152, 1975. 1 fig., 1 tab., 16 ref.

Descriptors: *Red tide, *Reefs, *Biological communities, *Mortality, *Gulf of Mexico, Florida, Succession, On-site investigations, Fishes, Coral, Mollusks, Crustaceans, Annelids, Benthic flora, Benthic fauna, Oxygen sag, Gymnodinium, Turbidity, Thermocline, Hypolimnion, Environmental effects.
Identifiers: *Ecological impact.

The effects of the 1971 spring-summer red tide on mid-eastern Gulf of Mexico patch reef communities are described, based on in situ SCUBA observations at scattered sites off Sarasota, Florida. Reef fishes, acleractinian and alcyonarian corals, mollusks, decapod crustaceans, polychaetous annelids, tunicates, poriferans, echinoderms, and benthic algae sustained heavy mortalities, although mortalities of benthic reef invertebrates may not have been due to Gymnodinium breve toxins but to secondary effects (oxygen depletion, hydrogen sulfide poisoning, bacterial and fungal infections). Under proper environmental conditions, red tides can cause almost complete destruction of shallow-water reef biotas from large areas of the inner central-West Florida Shelf. Recolonization by certain biotic groups (benthic algae and fishes) is relatively rapid, but that of others (scleractinian and alcyonarian corals and echinoderms) may require several years. Seasonal and true ecological progression after certain red tides may temporarily cause floral and faunal assemblages to be qualitatively and quantitatively different from those prior to the red tide. Red tides, especially those generated beneath pronounced thermoclines, may regulate the composition, abundance, and distribution of shallow-water reef biotas in mid-eastern Gulf of Mexico. Periodic occurrence of red tides may prevent evolution of climax or equilibrium reef communities. (Buchanan-Davidson--Wisconsin).
W76-07615

LAND DRAINAGE AS A FACTOR IN 'RED TIDE' DEVELOPMENT,
Department of the Environment, Ottawa (Ontario). Shellfish Water Quality Div.
A. Prakash.
Environmental Letters, Vol. 9, No. 2, p. 121-128, 1975. 20 ref.

Descriptors: *Surface drainage, *Dinoflagellates, *Red tide, *Environmental effects, Growth rates, Coasts, Salinity, Pollutants, Trace elements, Humus, Productivity, Organic matter.
Identifiers: Gonyaulax.

The mechanisms and factors involved in the development of red tides are not completely understood, but coastal red tides are primarily caused by a spectacular growth of marine dinoflagellates. Generally marine dinoflagellates thrive best under conditions of low salinity and high organic enrichment, conditions especially found in areas of river discharge and/or after heavy rainfalls. Indirect evidence suggests that heavy rainfall or land drainage is a prerequisite to most dinoflagellate blooms in coastal waters. Most marine dinoflagellates in laboratory cultures show optimal growth in salinities much below those of coastal waters. Land drainage lowers salinity of coastal waters and contributes to stratification, photic zone stability, convergence, and other mechanisms which may influence or control dinoflagellate growth. Biologically active substances, such as vitamins, chelators, antibiotics, auxins, decomposition products, extracellular metabolites, and humic compounds, are important factors in phytoplankton productivity. There is ex-

perimental evidence that humic substances exert a stimulatory effect on marine dinoflagellates and that maximum growth responses are generated by predominantly low molecular weight, water soluble humic fractions; consequently humus-laden runoff could create conditions conducive to red tide development. Sewage outfall discharges containing organic material may also create conditions favorable to dinoflagellate growth and development of red tides. (Buchanan-Davidson--Wisconsin)
W76-07616

SOME OF THE GROWTH CHARACTERISTICS OF GONYAULAX TAMARENSIS ISOLATED FROM THE GULF OF MAINE,
Salem State College, Mass. Dept. of Biology.
E. J. Cole, C. M. Yentsch, C. S. Yentsch, and M. Salvaggio.
Environmental Letters, Vol. 9, No. 2, p. 153-166, 1975. 5 fig., 13 ref.

Descriptors: *Red tide, *Growth rates, *Nuisance algae, *Gulfs, Light intensity, Maine, Water temperature, Chlorophyll, Cultures, Nitrates, Marine algae, Temperate, Canada, Dinoflagellates.
Identifiers: *Gonyaulax tamarensis, Dunnaliella, Phaeodactylum, *Gulf of Maine.

Gonyaulax tamarensis isolated from the Gulf of Maine during a red tide outbreak in September 1972 was studied. Light saturation curves were characteristic of shade species, and it is not unique in its capacity to use light. Optimal growth occurred at 18C. Encystment and no net growth were characteristic at 5C. Division rates were less and chlorophyll concentrations only slightly above those observed in 1972 bloom. The major difference in growth between axenic and non-axenic cultures was the long lag in axenic cultures; after three weeks the growth rates were almost identical. Changes in nitrate consumption correlated inversely with changes in chlorophyll. No marked low nitrogen requirement was observed compared to Dunaliella and Phaeodactylum. Similar chlorophyll levels/unit nitrate were found in Gonyaulax and Phaeodactylum, which had about half as much chlorophyll/unit nitrate as Dunaliella. Gonyaulax was a typical temperate phytoplankton and responded much like other phytoplankton to the parameters tested; its responses were identical to those of a Canadian Gonyaulax. The seed source may have come from Northern to Southern Gulf of Maine waters but not from an independent race. Several conjectures for the dominance of G. tamarensis at the time of the outbreak are discussed. (Buchanan-Davidson--Wisconsin).
W76-07617

REPORT ON A BIOCHEMICAL RED TIDE REPRESSIVE AGENT,
University of South Florida, Tampa. Dept. of Chemistry.
E. C. Kutt, and D. F. Martin.
Environmental Letters, Vol. 9, No. 2, p. 195-208, 1975. 3 fig., 3 tab., 18 ref.

Descriptors: *Chemcontrol, *Biocontrol, *Red tide, *Gymnodinium, Estuaries, Nuisance algae, *Florida, Economic impact, Predation, Cyanophyta, Fish toxins, Algal toxins, Nutrient requirements, Biodegradation, Dispersion, Gulf of Mexico, Coasts.
Identifiers: *Gymnodinium breve, Tintinnids, Gomphosphaeria aponina.

Estuarine red tides caused by definite species tend to occur yearly at specific times off the Florida coast; whether they spread and develop into catastrophic blooms depends on availability of a suitable environment and/or absence of competing or predator organisms. Naturally occurring organisms promising for red tide control are, in cool waters, a ciliate Tintinnid which grazes on red tide organisms and in warm waters, the cyanophyle Gomphosphaeria aponina, which inhibits Gymnodinium breve growth and excretes a toxic substance (aponin). Gomphosphaeria grows rapidly. Its deleterious effect on Gymnodinium is probably not due to nutrient depletion but may be due to biochemical interrelations, such as environmental regulation by external metabolite production. The aponin caused up to 95% Gymnodinium mortality. Fish showed extensive gill ruddiness and died in 24 hours. The effects of salinity, temperature dependence, and nutrition on Gomphosphaeria must be studied. Stability, degree of non-absorptiveness, resistance to biodegradation, and capacity of the watermass to minimize dispersion of metabolites must be considered. Treatment of small areas with biochemical agents could prevent major blooms. If treatment of areas where red tides are first detected is followed by concentration by the same forces which concentrate Gymnodinium, red tides might not be a threat. (Buchanan-Davidson--Wisconsin).
W76-07618

IMPLICATIONS OF DINOFLAGELLATE LIFE CYCLES ON INITIATION OF GYMNODINIUM BREVE RED TIDES,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
K. A. Steidinger.
Environmental Letters, Vol. 9, No. 2, p. 129-139, 1975. 2 tab., 50 ref.

Descriptors: *Dinoflagellates, *Gymnodinium, *Red tide, *Life cycles, *Diapause, Florida, Growth stages, Estuaries, Coasts, Germination, Dormancy, Life history studies, Reproduction, Temperature, Environmental effects, Varieties, Gulf of Mexico.
Identifiers: Sexual reproduction, Offshore, Benthic resting cyst stages.

Knowledge of benthic and pelagic stages in life cycles is needed to understand dinoflagellate distribution, seasonal growth patterns, and succession in coastal and estuarine waters. Ten dinoflagellate life cycles are known to include fertilization and formation of pelagic motile and nonmotile or benthic nonmotile zygotes. Knowledge concerning germination, dormancy, and sexuality is reviewed. Copulation may occur at specific cell surface sites. Sexual reproduction is slow, occurs at specific times in the life cycle, and can proceed undetected. Some dinoflagellates have resting cysts (dormant stages, often with thick walls). Temperature may be the key environmental factor in excystment. Species with and without armored cysts are listed. Cysts may be zygotes, dormant, or form seed populations. Gymnodinium breve red tides along Florida's west coast usually begin 18-74 km offshore but can be brought shoreward, depending on currents, winds, and cell longevity. Initial blooms are localized, suggesting existence of seed beds. If Gymnodinium breve has a benthic resting stage, seed populations or seed beds might be mapped. Further life cycle studies on differences in morphological and/or cytological generations, length of dormancy, and factors influencing encystment and excystment on Gymnodinium breve and other dinoflagellates associated with red tides would contribute to control measures. (Buchanan-Davidson--Wisconsin).
W76-07619

AN ANALYTICAL STUDY OF THE ROLE OF VARIOUS FACTORS CAUSING RED TIDE OUTBREAKS OF TRICHODISMIUM AS DEDUCED FROM FIELD AND LABORATORY OBSERVATION,
V. C. Ramamurthy.
Environmental Letters, Vol. 9, No. 2, p. 179-193, 1975. 4 fig., 1 tab., 28 ref.

Descriptors: *Red tide, *Marine algae, Subtropic, Fish food organisms, Nutrient requirements, *Cyanophyta, Beneficial use, Nitrates, Phosphates, Growth rates, Nitrogen fixation.
Identifiers: *Trichodesmium erythraeum, Gibberellic acid.

The marine blue green alga Trichodesmium is often found during red tides in sub-tropical areas. Fish mortality during Trichodesmium outbreaks may be due to asphyxiation rather than toxins, as it is an important fish food source. Trichodesmium outbreaks are also new nitrogen sources to the nitrogen demand of tropical oceans. When the effect of gibberellic acid on Trichodesmium erythraeum and the diatom Melosira sulcata cell multiplication was studied, there was an increase in cell population density as a function of gibberellic acid concentration to a maximum level. Gibberellic acid accelerated cell division, reducing the interval between successive divisions. One causative factor of red tides may be the presence of growth-promoting substances, rather than upwelling or rainfall. Red tides appear in the warmest seasons during periods of light winds. Trichodesmium cultures were not markedly affected by increasing nitrate or phosphate concentrations above normal levels. When the phosphate concentration was decreased below normal, the cells began to disintegrate and decompose; when the nitrate concentration was decreased, the cells remained viable but failed to multiply. In nitrogen-free media, cell multiplication in terms of nitrogen fixation increased rapidly. Trichodesmium erythraeum thrives and multiplies in nitrogen-impoverished waters. When and where red tides will occur cannot be predicted. (Buchanan-Davidson--Wisconsin)
W76-07620

OCCURRENCE OF FORAMINIFERA, MOLLUSCS AND OSTRACODS ADJACENT TO THE INDUSTRIALIZED SHORELINE OF CANSO STRAIT, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
C. T. Schafer, F. J. E. Wagner, and C. Ferguson.
Water, Air and Soil Pollution, Vol. 5, No. 1, p. 79-96, 1975. 10 fig., 2 tab., 20 ref.

Descriptors: Marine animals, *Bioindicators, *Crustaceans, *Distribution patterns, *Water pollution effects, *Mollusks, *Canada, Industrial wastes, Snails, Straits, Sea water, Metals, Trace elements, Varieties, Bottom sediments, Copper, Iron, Manganese, Zinc, Carbon.
Identifiers: *Foraminifera, *Ostracods, Canso Strait(Nova Scotia).

Distributions and relationships between foraminifera, molluscs, and ostracods in moderately polluted portions of Canso Strait, Nova Scotia, showed high, moderate, and low tolerances to industrial effluents, respectively. Particulate matter near the industrialized shore contained adsorbed and complexed trace metals. Maps of species distributions and trace metal concentrations indicated that contaminated surface water movement was usually southward. Sediment particle size was controlled by water depth except near the industrialized shore where bottom sediments were characterized by anomalous copper, iron, manganese, zinc, and organic carbon concentrations. Foraminifera productivity was low near the industrialized shore and high in shallow environments where sediments contained 0.5 to 1.0% organic carbon. Foraminifera species diversity and abundance correlated with bottom sediment zinc levels. Pollutant stressed environments contained large numbers of the foraminifer Eggerella advena, Elphidium incertum/clavatum group, the mollusc Modiolus modiolus, and ostracods including Baffinicythere emarginata and Muellerina canadensis. Biological and chemical parameters were used to formulate pollution indices. The area between the foraminifer and ostracod barren zones edges defined a polluted but inhabitable subnormal zone. (Buchanan-Davidson--Wisconsin).
W76-07621

LIGHT DEPENDENT DDT-EFFECT ON MICROALGAE, (IN GERMAN),
Technische Universitaet, Freising-Weihenstephan (West Germany).

H. Witsch, A. Munz, and C. Scheibe.
Beriche der Deutschen Botanischen Gesselschaft, Vol. 88, No. 2, p. 191-196, 1975. 1 fig., 9 ref.

Descriptors: *Algae, *Pesticide toxicity, *DDT, Light intensity, Algal control, Resistance, Water pollution effects, Environmental effects.
Identifiers: Microcystis aeruginosa, Coelastrum proboscideum.

The dry weight increase in (mg/100 ml) cultures of the algae Microcystis aeruginosa and Coelastrum proboscideum were measured in relation to the influence of DDT and on initial light-shocks of various intensities. High light-energy alone remarkably depressed growth of Microcystis aeruginosa and increasing light intensity also enhanced its sensitivity to DDT. Coelastrum proboscideum was largely insensitive to radiation as well as to the combination of light and DDT. It is stressed that data on the sensitivity or tolerance of an algal species to DDT must include all variables, or must specifically define conditions, because additional factors strongly influence these reactions. (Auen-Wisconsin).
W76-07622

ACCUMULATION OF MERCURY BY FISH OF THE LITTLE PINEY RIVER AND MILL CREEK,
Missouri Univ., Rolla. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-07670

CHARACTERIZATION OF LIMNETIC ZOOPLANKTON PHOSPHORUS EXCRETION AND FACTORS AFFECTING TEMPORAL EXCRETION RATES IN THE PHOSPHORUS CYCLE IN A LAKE,
New Hampshire Univ., Durham. Dept. of Zoology.
J. G. Ferrante.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-252 857, $5.00 in paper copy, $2.25 in microfiche. PhD thesis, September 1974. 69 p. 12 fig., 8 tab., 57 ref. OWRT A-029-NH (2).

Descriptors: *Cycling nutrients, *Zooplankton, *Phosphorus, Seston, Hypolimnion, Epilimnion, *New Hampshire, Absorption, Model studies, Organophosphorus compounds, Solubility.
Identifiers: *Phosphorus excretion, Stonehouse Pond(NH), Orthophosphates.

Temporal and spatial excretion rates were studied by determining changes in soluble reactive phosphorus following incubation of zooplankton (smaller or larger than 0.308 mm) collected from the epilimnion and hypolimnion of Stonehouse Pond, New Hampshire. Temporal excretion rates varied within size groups; similar patterns were observed in both strata. Excretion rates were high in spring and fall and low in winter. Smaller animals excreted at higher rates. Excretion rates were higher by animals in the epilimnion compared to the hypolimnion. Phosphorus uptake by natural seston was compared to the amount released by zooplankton. In the spring of 1973, excretion rates increased but were offset by greater increases in the phosphorus uptake rate by seston, suggesting that at this time zooplankton phosphorus excretions were not enough to supply the amount of phosphorus being removed by seston. Phosphorus excretion studies of zooplankton collected in the spring of 1974 showed that the soluble phosphorus component released from natural populations had the same molecular weight as orthophosphate and behaved similarly in seston incorporation studies. Approximately 15% of total phosphorus was organic but could not be identified by ultraviolet spectroscopy. There was no evidence of nucleic acid excretion or hydrolytic degradation products. (Buchanan-Davidson--Wisconsin).
W76-07675

AN OUTBREAK OF SHIGELLA SONNEI GASTROENTERITIS ON COLORADO RIVER RAFT TRIPS,
Center for Disease Control, Atlanta, Ga.
M. H. Merson, D. A. Goldman, K. M. Boyer, N. J. Peterson, and C. Patton.
Am J Epidemiol. 100(3), p 186-196, 1974.

Descriptors: *Colorado River, *Human diseases, Public health, *Shigella, Enteric bacteria, Water analysis, Bacteriology, Chemical analysis, Waste disposal.
Identifiers: Rafts, Shigella-Sonnei.

In the summer of 1972 an outbreak of acute gastroenteritis occurred among passengers and boatmen on Colorado River raft trips. The illness was characterized by diarrhea, abdominal cramps, and fever. Laboratory results indicated that the outbreak was caused by S. sonnei. The illness originated among the boatmen and spread to passengers primarily by person-to-person transmission. No common food or water vehicle could be identified as the source of the outbreak. A bacteriologic and chemical analysis of water from the Colorado River and some of its tributaries demonstrated that this water is unsuitable for drinking unless purified. The Colorado River Health Committee was created to establish guidelines for food and water handling and sewage disposal aboard the rafts and to initiate a health training course for boatmen.--Copyright 1975, Biological Abstracts, Inc.
W76-07691

BIOLOGICAL AVAILABILITY OF MERCURY IN SWORDFISH (XIPHIAS GLADIUS),
Nabisco Research and Development Center, Fair Lawn, N. J.
B. R. Stillings, and H. R. Lagally.
Nutr Rep Int. 10(5), p 261-267, 1974.

Descriptors: *Mercury, Fish, Chlorides, Rodents, Absorption, Biology, Bioassay, Biochemistry.
Identifiers: *Swordfish, Xiphias-Gladius, Methylmercuric chloride.

In a study with weanling rats, the biological availability of Hg in swordfish was compared to that in methylmercuric chloride. Rats fed swordfish excreted significantly more Hg and retained slightly less in tissues. The biological availability of Hg in swordfish is slightly lower than that in methylmercuric chloride.--Copyright 1975, Biological Abstracts, Inc.
W76-07694

AN ENZOOTIC NUCLEAR POLYHEDROSIS VIRUS OF PINK SHRIMP: ULTRASTRUCTURE, PREVALENCE, AND ENHANCEMENT,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
J. A. Couch.
J Invertebr Pathol. 24(3), p 311-331, 1974.

Descriptors: *Viruses, Shrimp, *Pink shrimp, Biology, Gulf of Mexico, *Cytological studies.
Identifiers: Baculovirus, *Enzootic nuclear polyhedrosis virsus, Penaei, Penaeus-Duorarum.

A nuclear polyhedrosis virus exists in pink shrimp, Penaeus duorarum, from waters of the northern Gulf of Mexico. This virus is rod-shaped, 269 nm long and possesses an outer envelope surrounding its nucleocapsid. The nucleocapsid is 50 nm in diameter. The virus occurs in nuclei of host hepatopancreatic and midgut cells and is both free in the nucleus and occluded within pyramidal-shaped polyhedral inclusion bodies (PIB's). Histochemically and ultrastructurally, the shrimp PIB's appear to be ribonucleoprotein and in fine structure bear close resemblance to polyhedral inclusion bodies of Baculovirus species from insects. The lattice line-to-line spacing is greater than that usually reported for insect PIB's. Crowding, chemical stress of shrimp in aquaria may enhance and increase the virus infection and prevalence. In limited experiments, shrimp fed heavily infected hepatopancreatic tissues had much higher mortality than controls fed only fish. The virus appears to be enzootic in pink shrimp, in nature. Cytopathological changes in infected cells of shrimp appear similar to those in insects infected with certain species Baculovirus penaei n. sp. is proposed for the shrimp virus.--Copyright 1975, Biological Abstracts, Inc.
W76-07695

ORGANOCHLORINE PESTICIDE RESIDUES IN CULTURED FISHES OF TAIWAN,
Academia Sinica, Taipei (Taiwan). Inst. of Zoology.
S. S. Jeng, and L. T. Sun.
Bull Inst Zool Acad Sin Taipei. 13(1), p 37-46, 1974.

Descriptors: Pesticide residues, Fish, Asia, Shellfish, Oysters, Clams, Gas chromatography, Pollutant identification, DDT, Aldrin, Endrin, Dieldrin, Heptachlor, Pollutant identification.

The 1st report on organochlorine pesticide residues in cultured fishes and shellfishes of Taiwan suggests that the aquatic animals are not contaminated by pesticides. From Sept. 1972-Sept. 1973, 167 fishes belonging to 5 spp., 631 oysters and 20 clams were analyzed. No aldrin, endrin, heptachlor and heptachlor epoxide were detected within the sensitivity limit of the gas chromatographic method in all the fish and shellfish examined. Small residues of the BHC group were present in almost all the fish and shellfish with the maximum value not higher than 0.16 ppm in fish muscle or viscera. Also present in the edible portions of the fish and oysters were small amounts of DDT group compounds with values less than 0.15 ppm. DDT and its metabolites were not detected in clams. An insignificant amount of dieldrin (less than 0.05 ppm) was found in fish. The use of organochlorine pesticides in the past 20 yr did not result in significant accumulations of organochlorine pesticides in the fishes and shellfishes to render them unsuitable for human consumption.--Copyright 1975, Biological Abstracts, Inc.
W76-07697

TOXICITY OF INSECTICIDES (COMMERCIAL FORMULATIONS) TO THE EXOTIC FISH, COMMON CARP CYRPINUS CARPIO COMMUNIS LINNAEUS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Zoology-Entomology.
H. S. Toor, K. Mehta, and S. Chhina.
J Res Punjab Agric Univ. 10(3), p 341-345, 1973.

Descriptors: *Insecticides, *Toxicity, *Fish, *Carp, *Water pollution effects, Endrin, Resistance.
Identifiers: Cyprinus-Carpio-Communis, Dimethoate, Endosulfan, Malathion, Exotic fish.

The tests were conducted to determine the toxic effects (relevant to environmental pollution) of endrin, endosulfan, dimethoate and malathion. Emulsions of these insecticides were tested against small specimens measuring 7.5 to 10.5 cm. Endrin proved to be the most toxic, followed by endosulfan, malathion and dimethoate. The threshold toxicity and the maximum sublethal doses for the endrin were 0.003 and 0.0018 ppm respectively. For endosulfan, they were 0.007 and 0.0050 ppm; for malathion, they were 20 and 17 ppm, and for dimethoate they were 40 and 45 ppm respectively. The physical reactions of the fish poisoned with these insecticides were studied. The fish exhibited wild swimming, excitation and loss of equilibrium. Ultimately, they sank to the bottom of the water and died.--Copyright 1974, Biological Abstracts, Inc.
W76-07699

TOXICITY BIOASSAYS OF CADMIUM ON SELECTED FRESHWATER INVERTEBRATES AND THE INTERACTION OF CADMIUM AND ZINC ON THE FRESHWATER SHRIMP, PARATYA TASMANIENSIS RIEK,
Adelaide Univ. (Australia). Dept. of Zoology.
V. J. Thorp, and P. S. Lake.
Aust J Mar Freshwater Res. 25(1), p 97-104, 1974.

Descriptors: *Bioassay, *Toxicity, Invertebrates, Freshwater fish, Resistance, Seasonal, *Cadmium, *Sulfates, *Shrimp, *Australia.
Identifiers: Atalophlebia-Australis, Austrochiltonia-Subtenuis, Ischnura-Heterosticta, Leptoceridae, Paratya-Tasmaniensis, Shrimp, Tasmania.

In acute toxicity bioassays with cadmium sulfate at 15 degrees C in soft water (total hardness 10 mg/l as calcium carbonate), the concentrations fatal to 50% of the test animals were determined for 5 freshwater invertebrate species. The 96 h median lethal concentration (LC50) of Cd was 0.04 mg/l for the amphipod Austrochiltonia subtenuis Sayce, 0.06 mg/l for the shrimp Paratya tasmaniensis Riek, 0.84 mg/l for the ephemeropteran nymph Atalophlebia australis Walker, 250 mg/l for the zygopteran nymph Ischnura heterosticta (Burmeister) and well over 2000 mg/l for a trichopteran larva of the Leptoceridae. The bioassays on Paratya indicated that there may be seasonal differences in sensitivity to Cd. The 96 h LC50 for Xn for Paratya was 1.21 mg/l. Zn and Cd appeared to interact less than additively at concentrations below 1 toxic unit. Above this concentration, their interaction was strictly additive.--Copyright 1974, Biological Abstracts, Inc.
W76-07700

POLLUTION OF A TASMANIAN RIVER BY MINE EFFLUENTS: I. CHEMICAL EVIDENCE,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W76-07704

POLLUTION OF A TASMANIAN RIVER BY MINE EFFLUENTS: II. DISTRIBUTION OF MACROINVERTEBRATES,
Tasmania Univ., Hobart (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W76-07705

ULTRASTRUCTURAL CHANGES INDUCED BY LOW CONCENTRATIONS OF DDT IN THE LIVERS OF THE ZEBRAFISH AND THE GUPPY,
New Jersey School of Medicine, Newark. Dept. of Anatomy.
P. Weis.
Chem-Biol Interactions. 8(1), p 25-30, 1974.

Descriptors: *Fish, *DDT, Effects, Insecticides, Pesticides, *Fish diseases, Fish physiology, *Resistance, Pollutants, Toxins, *Water pollution effects.
Identifiers: Brachydanio-Rerio, Guppies, Livers, Poecilia-Reticulata, Tolerance, *Zebrafish.

Following exposure to 0.3-3.0 ppb DDT, the livers of zebrafish (Brachydanio rerio) and guppies (Poecilia reticulata) were examined by electron microscopy. After 24 h in 1.0 ppb or 72 h in 0.3 ppb, zebrafish had a complete loss of glycogen, decrease in cell size and a cytoplasmic compartment filled with rough endoplasmic reticulum (ER). Guppies exposed for periods of up to 28 days showed only a gradual accumulation of smooth ER and no change in glycogen, lipid, rough ER or cell size. The relationship of these changes to the zebrafish's sensitivity and the guppy's tolerance to DDT is discussed.--Copyright 1974, Biological Abstracts, Inc.
W76-07706

STUDIES OF TOLERANCE TO HEAVY METALS IN THE FLORA OF THE RIVERS YSTWYTH AND CLARACH, WALES,
University Coll. of Wales, Aberystwyth. Dept. of Botany and Microbiology.
R. O. McLean, and A. K. Jones.
Freshwater Biology, Vol. 5, p. 431-444, 1975. 6 fig., 8 tab., 31 ref.

Descriptors: *Algae, Water pollution effects, *Heavy metals, *Bioindicators, Lead, Iron, Zinc, Copper, Manganese, *Absorption, *Diatoms, *Chlorophyta, *Resistance, Zinc radioisotopes, Tracers, Water quality control, Environmental effects, Laboratory tests, On-site investigations, Rivers, Analytical techniques, Plant populations.
Identifiers: *River Ystwyth(Wales), *River Clarach(Wales), Bioaccumulation, Hormidium spp, Scapania, Fontinalis.

A survey of the river Ystwyth demonstrated metal pollution, especially below old lead miles. Hormidium spp. were the most tolerant filamentous green algae. Scapania undulata was a tolerant bryophyte in the Ystwyth and Clarach rivers. It was found alone in polluted sites and less frequently in cleaner areas. Metal extracts of S. undulata showed variation in metal concentrations of the environment to some extent. Lower levels of Fe, Pb and Mn were found in Scapania than in the less tolerant Fontinalis squamosa, which died 18 weeks after transplantation to polluted sites. Zn 65 tracing experiments showed that both plants had similar uptake patterns for the metal, but that the amount taken up was slightly higher in the less tolerant Fontinalis. Diatom flora varied according to degree of pollution in an area. (Katz)
W76-07712

FLUORESCENT WHITENING AGENTS: ACUTE FISH TOXICITY AND ACCUMULATION STUDIES,
Procter and Gamble Co., Cincinnati, Ohio. Environmental Water Quality Research Dept.
R. N. Sturm, K. E. Williams, and K. S. Macek.
Water Research, Vol. 9, No. 2, p. 211-219, February, 1975. 5 fig., 4 tab., 4 ref.

Descriptors: Laboratory tests, *Sunfishes, *Channel catfish, *Bioassay, *Toxicity, Water pollution sources, *Detergents, *Anions, *Absorption, Organic compounds, Methodology, Analytical techniques, Pollutant identification.
Identifiers: Bioaccumulation, *Fluorescent whitening agents, Tissue analysis.

Four fluorescent whitening agents (FWA) were tested to determine their acute toxicity to the bluegill (Lepomis macrochirus) as well as their potential for accumulation in the flesh of the bluegill and channel catfish (Ictalurus punctatus). Results of acute toxicity bioassays showed no acutely toxic effects on fish at levels well above projected environmental levels. Rates and maximum levels of accumulation were evaluated in the laboratory for 90-105 days, followed by 28-day examination of the rate of elimination. Neither species accumulated any of three anionic fluorescent whitening agents when exposed to concentrations of 0.125, 1.25 or 12.5 micrograms/liter. A nonionic FWA not currently used in U.S. detergents was accumulated at the two highest concentrations and was completely eliminated by fish after 14 days in water devoid of the chemical. No significant accumulation of any FWA by fish was observed at levels approximating projected environmental concentrations. (Katz)
W76-07713

TEMPERATURE SELECTION IN BROOK TROUT (SALVELINUS FONTINALIS) FOLLOWING EXPOSURE TO DDT, PCB OR PHENOL,
University of Western Ontario, London. Dept. of Zoology.
D. L. Miller, and D. M. Ogilvie.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 5, p. 545-551, 1975. 4 fig., 10 ref.

Descriptors: *Pesticides, Water pollution effects, Laboratory tests, *Temperature, *DDT, *Polychlorinated biphenyls, *Brook trout, Environmental effects, *Toxicity, *Phenols, Lethal limit, Mortality, Fish behavior, Thermocline, Trout, Toxicants, Chlorinated hydrocarbon pesticides.
Identifiers: Sublethal effects.

Brook trout were exposed for 24 hours to DDT (10 to 50 ppb), phenol (0.75 to 10 ppm), or PCB (25 to 100 ppm). Following this exposure, the fish were placed in a temperature gradient apparatus in order to determine the effect of these pesticides on temperature selection. Fish exposed to the lowest dose of DDT (10 ppb) selected lower temperatures than control fish, whereas the highest dose (50 ppb) increased the selected temperature. The 24 hour LD50 was estimated at 54 ppb. Exposure to phenol produced a downward shift in selected temperature. The 24 hour LD50 was estimated at 11.7 ppm for phenol. No level of PCB tested had an effect on selected temperatures of brook trout. Despite the chemical similarity of DDT and PCB, it appears that PCB is less toxic than DDT and does not alter the thermoregulatory behavior of fish as does DDT. (Katz)
W76-07714

DECHLORINATION OF MUNICIPAL SEWAGE USING SULFUR DIOXIDE,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
D. W. Martens, and J. A. Servizi.
Progress Report No. 32, 1975. 24 p., 1 fig., 8 tab., 26 ref.

Descriptors: *Bioassay, *Toxicity, Municipal wastes, *Chlorination, Sewage treatment, Quality control, *Sulfur compounds , *Mortality, *Pink salmon, *Sockeye salmon, Sewage lagoons, Laboratory tests, Analytical techniques, Lethal limit, Dissolved oxygen, Hydrogen ion concentration, Methodology, Disinfection, Water treatment, Water purification.
Identifiers: *Dechlorination, Sulfur dioxide, Oncorhynchus nerka.

Simultaneous continuous flow bioasssys of primary treated, chlorinated and dechlorinated municipal sewage were conducted with sockeye and pink salmon to evaluate the effectiveness of sulfur dioxide on removal of chlorine and chlorine induced toxicity. Chlorination decreased the average Mean Survival Time (MST) of sockeye in undiluted primary treated sewage from 293 minutes to 32 minutes. Dechlorination increased the average MST to 434 minutes indicating that all the chlorine induced toxicity and some primary sewage toxicity was removed. However, sewage which had received primary treatment remained acutely toxic to sockeye and pink salmon following chlorination-dechlorination. Dissolved oxygen and pH were not adversely affected by sulfur dioxide. The cost of dechlorination using sulfur dioxide is discussed. Lagooning is recommended as an alternative to chemical dechlorination where flows are small and land requirements not great. (Katz)
W76-07715

THE EFFECTS OF WATER-SOLUBLE PETROLEUM COMPONENTS ON THE GROWTH OF CHLORELLA VULGARIS BEIJERINCK,
Toronto Univ. (Ontario). Dept. of Botany.
P. B. Kauss, and T. C. Hutchinson.
Environmental Pollution, Vol. 9, p 157-174, 1975. 7 fig, 3 tab, 40 ref.

Descriptors: *Toxicity, *Chlorella, *Algae, Oil, *Oil pollution, *Bioassay, *Growth rates, Plant

growth, Evaporation, Primary productivity, Water pollution effects, Environmental effects, Food webs, Methodology, Organic compounds, Laboratory tests, Separation techniques, Analytical techniques, Thermodynamics.
Identifiers: Crude oil extracts, *Chlorella vulgaris, Sublethal effects, Benzene, Toluene, Xylene, Naphthalene.

Laboratory tests showed differences in toxicity of the aqueous extracts of seven different crude oils and one refined product to Chlorella. Reduction in cell numbers varied from 5% to 41%, during the first 48 hours. This toxicity was apparently a short-term lag phase. The observed toxicity of oil extracts is due to highly volatile compounds that were lost by evaporation within 24 hours. A significant stimulation of growth was observed with three of the oil extracts after their toxic compounds had evaporated. It is not known if this reflected an actual ability to utilize certain hydrocarbons heterotrophically from the extract. Other interpretations are discussed. (Katz)
W76-07716

METHOD FOR ASSESSMENT OF TOXICITY OR EFFICACY OF MIXTURES OF CHEMICALS,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
L. L. Marking, and V. K. Dawson.
Investigations in Fish Control, No. 67, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C., 1975. 8 p, 1 fig, 2 tab, 28 ref.

Descriptors: *Toxicity, *Pesticides, Assessments, Methodology, Analytical techniques, *Bioassay, Laboratory tests, *Zinc, *Toxicants, *Rotenone, *Rainbow trout, *Mathematical models, Sunfishes, Lethal limit, Mortality, Rhodamine, Copper, Antimycin a.
Identifiers: Synergistic effect, Additive index, Salmo gairdneri, Lepomis macrochirus, Cyanide, MS-222, Malachite green, Dibrom.

The individual toxic contributions of poisons were summed, and the additive toxicity was defined by a linear index for two chemicals in combination. This index expresses the toxicity quantitatively: zero indicates additive toxicity, negative values indicate less than additive toxicity, and positive values indicate greater than additive toxicity. Examples from the literature were selected and tests were conducted in the laboratory to assess the additive toxicity of selected chemical mixtures to fish. The values ranged from -1.37 for zinc and cyanide to 7.20 for malathion and Delnav (R). The method quantifies additive toxicity or efficacy, and assists in evaluating the advantages as well as environmental hazards resulting from chemical mixtures. (Katz)
W76-07718

DDT RESIDUES IN COD LIVERS FROM THE MARITIME PROVINCES OF CANADA,
Fisheries and Marine Service, Halifax (Nova Scotia). Inspection Branch.
G. G. Sims, C. E. Cosham, J. R. Campbell, and M. C. Murray.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 4, p 505-512, 1975. 1 fig, 4 tab, 16 ref.

Descriptors: *DDT, *DDE, *Pesticide residues, *Lipids, Commercial fish, *Path of pollutants, Pesticides, *Absorption, Analytical techniques, Chlorinated hydrocarbon pesticides, Methodology, Polychlorinated biphenyls, Pollutant identification, Canada.
Identifiers: Gadus morhua, *Cod, *Cod liver oil, Tissue analysis.

Residues of DDT and its analogs were estimated in cod liver samples (Gadus morhua) collected off the Maritime Provinces of Canada. The residue levels indicated widespread distribution of DDT over the entire region sampled. Variations in the relative contributions of DDE and DDT to the total DDT residues were noted and preferential accumulation of these residues in lipid rich tissues was noted. Residue levels found in cod livers were compared to residue levels determined in cod flesh taken from some of the same specimens and also to residue levels in commercially refined cod liver oils. Samples of each of these types were analyzed for DDT and PCB simultaneously. Commercial cod liver oil had only 10% (1.9 ppm) the amount of DDT found in cod liver. (Katz)
W76-07719

CONIFER DAMAGE AND DEATH ASSOCIATED WITH THE USE OF HIGHWAY DEICING SALT IN THE LAKE TAHOE BASIN OF CALIFORNIA AND NEVADA,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
R. F. Scharpf, and M. Srago.
In: Proceedings: Lake Tahoe Research Seminar II, 27 September 1974, Sands Vagabond Convention Center, South Lake Tahoe, California. Report No. NSF/RA/G-74-012, p 36-61. 2 fig, 5 tab, 11 ref.

Descriptors: *Salts, *Highways, *Highway icing, *Conifers, Salt tolerance, Coniferous trees, Pine trees, Vegetation effects, Vegetation, Water pollution, Water pollution sources, Pollutants, Soil contamination, Plant physiology, Plant pathology.
Identifiers: *Highway deicing, *Lake Tahoe(Nev - Calif).

In the winter of 1972-73 severe damage to conifers was observed along the major state and county highways in the Lake Tahoe Basin. Local foresters suspected highway deicing salt as the cause of damage. A biological evaluation was begun in the spring of 1973 to determine the cause and distribution of damage to the roadside conifers, the species affected, and the relationship of tree damage to the distances of trees from the highways. Estimates from the evaluation indicated that some 3000 trees died or were damaged on more than 300 locations in the basin. Browning of foliage, branch dieback, and in many cases, dead trees of all sizes and ages were observed. Damage and death were greater for trees near highways and less for trees at greater distances from the highways; in some cases damage occurred up to 60 feet from the pavement. Tests in the greenhouse, which involved adding different concentrations of salt solution to potted trees, duplicated symptoms and damage observed in the field. It was concluded that salt applied to the highways is a major cause of damage and death to roadside conifers in the basin. Damage probably will continue to occur if the use of sodium chloride for highway deicing continues at the present level. (See also W76-07793) (Sims - ISWS)
W76-07796

THE FISH FAUNA IN KANGAWA WATER SYSTEM, (IN JAPANESE),
Tokyo Univ. of Education, Nagano (Japan). Sugadaira Biological Lab.
H. Ando, and K. Aonuma.
Bull Sagadaira Biol Lab. 7, p 25-32, 1975.

Descriptors: Fish, Asia, *Fish populations.
Identifiers: Anguilla-Japonica, Carassius-Langsdorfii, Cobitis-Biwae, Cottus-Hilgendorfi, Cyprinus-Carpio, *Japan, Kangawa, Lefua-Echigonia, Liobagrus-Reini, Misgurnus-Anguillicaudatus, Moroco-Steindachneri-Steindachneri, Oncorhynchus-Keta, Oncorhynchus-Masou-Ishikawae, Plecoglossus-Altivelis, Pseudorasbora-Parva, Salvelinus-Fontinalis, Salvelinus-Leucomaenis-Pluvius, Tribolodon-Hakonensis-Hakonensis.

A total of 7 families and 17 spp. of fish were previously found in Kangawa Water System of Sanadamachi, Chisagata-kun, Nagano Prefecture, Japan. About 50 yr ago salmon disappeared from the water, and therefore presently 7 families and 16 spp. of fish live in Kangawa Water System. The 17 spp. are Oncorhynchus keta, Oncorhynchus mason f. ishikawae, Salmo gairdnerii f. iridens, Salvelinus leucomaenis pluvius, Salvelinus fontinalis, Plecoglossus altivelis, Pseudorasbora parva, Tribolodon hakonensis hakonenses, Syprinus carpio, Carassius langsdorfii, Misgurnus anguillicaudatus, Lefua echigonia, Cobitis biwae, Moroco steindachneri steindachneri, Liobagrus reini, Anguilla japonica, and Cottus hilgendorfi. Liobagrus reini are becoming rare recently, probably because of water pollution.--Copyright 1975, Biological Abstracts, Inc.
W76-07934

PRODUCTION OF SOME MASS CRUSTACEANS OF THE KUIBYSHEV RESERVOIR IN THE REGION OF SVIYAZH BAY, (IN RUSSIAN),
Kazan State Univ. (USSR). Dept. of Vertebrate Zoology.
R. K. Ziganshina, and E. M. Sofronova.
Biol Nauki 16(12), p 7-11, 1973.

Descriptors: *Crustaceans, Reservoirs, Bays, Daphinia, Production.
Identifiers: Acanthocyclops-Vernalis, Bosmina-Coregoni, Bosmina-Longirostris, Ceriodaphnia-Pulchella, Cyclops-Vicinus, Daphnia-Cucullata, Daphnia-Longispina, Diaphandsoma-Brachyurum, Eudiaptomus-Gracilis, Fecundity, Mesocyclops-Leuckarti, Moina-Rectirostris, Polyphemus-Pediculus, Russian-SFSR, Scapholeberis-Mucronata, Sida-Crystallina, Simocephalus-Vetulus, Span, Sviyazh, *USSR(Kuibyshev Reservoir).

On the basis of hydrobiological collections and experimental data the production of copepods and mass species of cladocerans of the Sviyazh Bay of the Kuibyzhev Reservoir on the Volga (Russian SFSR, USSR) was calculated. The production of copepods was considerably less than the productions of cladocernas and the production of the crustaceans on the whole was higher during a dry year (1969) than during a wet year (1970). The span of copepods was much greater than that of cladocerans and depended on the species and environmental factors. The fecundity of cladocerans depended mainly on the food supply; the fecundity of copepods depended on the environmental temperature. (Sida crystallina, Diaphanosoma brachuurum, Daphnia longispina, D. cucullata, Sinocephalus vetulus, Moina rectirostris, Ceriodaphnia pulchella, Scapholeberis mucronata, Bosmina longirostris, B. coregone, Polyphemus pediculus, Eudiaptomus gracilis, Cyclops vicinus, Acanthocyclops vernalis and Mesocyclops leuckarti are discussed.)--Copyright 1975, Biological Abstracts, Inc.
W76-07935

ECOLOGICAL OBSERVATIONS ON SIMULIIDAE OF THE ARRONE RIVER AND INFLUENTS OF THE BRACCIANO LAKE, (IN ITALIAN),
L. Rivosecchi, C. Cavallini, M. Nocciolo, and L. Rubeca.
Riv Parassitol 35(4), p 331-356, 1974.

Descriptors: Organic wastes, Water pollution, Thermal pollution, Europe, Lakes, Rivers, Ecology, Effluents.
Identifiers: Arrone, Boophthora-Erythrocephala, Bracciano, Cladophora, Eusimulium-Angustitarse, Eusimulium-Aureum, Eusimulium-Cryophilum, Eusimulium-Latigonium, Eusimulium-Latinum, Eusimulium-Latipes, Eusimulium-Latizonum-F-Paludicola, Eusimulium-Rubzovianum, *Italy, Nostoc, Obuchovia-Brevifilis, Odagmia-Dorieri, Odagmia-Nitidifrons, Odagmia-Ornata, Odagmia-Pontina, Odagmia-Variegata, *Simuliidae, Simulium-Galeratum, Thelohania, Wilhelmia-Lineata, Wilhelmia-Mediterranea.

Larvae and pupae were collected from 18 collecting stations in monthly collections. There were 16 spp. (Eusimulium cryophilum, E. angustitarse, E. latigonium, E. rubzovianum, E. latizonum F. paludicola, Odagmia ornata, O. nitidifrons, O. pontina, O. variegata, O. dorieri, Obuchovia brevifilis, Boophtora erythrocephala, Wilhelmia mediterranea, W. lineata, Simulium galeratum). In the area studied 4 zones were distinguised. Zones I and II have fairly pure waters. Zone III has strong organic pollution. Zone IV is a recovery zone. In zone I there are streams with fairly rapid waters; most of the larvae (about 70%) stick to debris, especially plastic materials. The most characteristic species of this zone is O. ornata (s.l.). The 3 spp. of this group (O. ornata, O. nitidifrons, O. pontina have 3 distinct filtering-apparatuses. Zone II has little brooks where ornytophilic species of the E. latipes and E. aureum groups develop; the E. latipes group prefers pure water, the E. aureum more polluted water. The Arrone River (Italy) has its source in zone III where there is strong auxotrophy; rocks are covered by Cladophora, Nostoc, etc. There are also high temperatures. The characteristic species is W. mediterranea. Zone IV has strong variations in level and in temperature. All the larvae cling to non-trailing plants. The most common species are W. lineata and S. galeratum. Parasitic organisms were also on Simuliidae larvae and adults (1% of the hosts for Microsporidia of the group Thelohania). For 10 spp. zonal and seasonal distributions are given. Some autoecological data on 14 spp. are summarized.--Copyright 1975, Biological Abstracts, Inc.
W76-07936

PRODUCTION OF A SEMI-VOLTINE CHIRONOMID, CHIRONOMUS COMMUTATUS STR., IN LAKE PORT-BIELH (CENTRAL PYRENEES), (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 2H.
W76-07939

BRIEF MICROBIOLOGICAL CHARACTERIZATION OF THE KAYRAKKUM RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.
N. I. Bogdanov.
Izv Akad Nauk Tadzh Ssr Otd Biol Nauk. 3, p 34-36, 1973.

Descriptors: Bacteria, *Phytoplankton, Primary productivity, Reservoirs, Microorganisms, *Decomposing organic matter, *Photosynthesis, Biomass, Eutrophication, Oligotrophy.
Identifiers: Tadzhik-SSR, USSR.

The Kayrakkum Reservoir (USSR) was studied to determine the rate of photosynthesis of phytoplankton, its abundance and biomass; the rate of breakdown of organic matter and dynamics of the abundance of bacterioplankton; and abundance of microorganisms in the bottom deposits of the Reservoir depending on their chemical composition. The reservoir is oligotrophic with respect to the rate of photosynthesis of phytoplankton. The breakdown of organic matter exceeds primary production by a factor of 2-3, which indicates a high activity of bacterioplankton. A study of the chemical composition and microflora of the bottom deposits established the role of bacteria as a food source of the benthic invertebrates and revealed a direct relationship between the paucity of the benthos and the microflora of the bottom deposits of the Reservoir. The Kayrakkum Reservoir is located on the Syr-Darya River in the Tadzhik SSR and has an area of 513 km2, volume of 4.2 km3 and average depth of 8.1 m.--Copyright 1975, Biological Abstracts, Inc.
W76-07941

PHYTOPLANKTON OF THE VLASINA LAKE DURING THE PERIOD 1949-1964, (IN SERBO-CROATIAN),
Institute for Biological Research, Belgrade (Yugoslovia).
For primary bibliographic entry see Field 2H.
W76-07942

A CHARACTERISTIC OF THE LAKES OF THE LECZYNSKO-WLODAWSKIE LAKE DISTRICT BASED ON ABIOTIC ENVIRONMENTAL FACTORS, (IN POLISH),
Marie Curie-Sklodowska Univ., Lublin (Poland). Inst. of Biology.
S. Raswan, W. Podgorski, and C. Kowalczyk.
Ann Univ Mariae Curiesklodowska Sect C Biol 29; p 231-246, 1974.

Descriptors: *Lakes, Europe, Phosphates, Conductivity, Environmental effects, Lime, *Oxidation, Temperature, *Organic matter.
Identifiers: Abiotic conditions, Leczynsko, *Poland, Wlodawskie.

The dependence among some abiotic factors and an attempt to classify the lakes of the Leczynsko-Wlodawskie Lake district (Poland) are discussed on the basis of previously examined physico-chemical factors. There are correlations between the amount of lime and conductivity, phosphate and the organic matter content, temperature and oxidation, and pH and Mg, Fe and NH3. Electrolytic conductivity, conditioned by the lime of content and general oxidation, is the main factor defining the properties of the lakes. The remaining coefficients have an indirect or small effect on the differentiation of the lakes. On the basis of numerical values, 15 variants of lake classification were obtained.--Copyright 1975, Biological Abstracts, Inc.
W76-07943

HYDROBIOLOGICAL CONDITION IN THE RESERVOIR-COOLER OF THE LITHUANIAN STATE REGIONAL ELECTRIC POWER STATION, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
A. S. Astrauskas, and L. A. Rachyunas.
Gidrobiol Zh 11(1); p 19-27, 1975.

Descriptors: *Algae, Biomass, Reservoir, *Thermal pollution, Zooplankton, Spawning, Fish, Organic matter, Hydroelectric powerplants.
Identifiers: *Hydrobiological conditions, Lithuanian, SSR, USSR.

With heating a complex interaction system of hydrodynamic factors influencing the formation of washout zones and suspension accumulation was created in the reservoir (USSR). The group complex is under reconstruction. In the heated zone algae and higher water plants vegetate all year round. Zooplankton is less abundant because of evacuation of the organisms into the open part of the water body. After passing through the station cooler the number of organisms and their biomass are reduced by 1/2. The number and biomass of the benthic invertebrates are less with a comparatively greater species diversity (determined by exacuation of organic suspensions and detritus). Divergences in time and duration of spawning in different thermal zones are detected for certain fish species. The spawning for most species in the heated part starts earlier and takes less time.--Copyright 1975, Biological Abstracts, Inc.
W76-07944

THE PRODUCTIVITY OF THE WATERS OF MAR GRANDE AND MAR PICCOLO OF TARANTO (1962-1969), (IN ITALIAN),
For primary bibliographic entry see Field 2L.
W76-07947

PARTICULARS OF SOME SPECIMENS OF ALGAL FLORA OF THE PONDS OF BERRE AND VAINE (BOUCHES-DU-RHONE), (IN FRENCH),
Aix-Marseille-2 Univ. (France). Laboratoire de Biologie Vegetale.
R. Riouall.
Bull Soc Phycol Fr 19, p3-16, 1974.

Descriptors: *Algae, Lakes, Europe, Ponds, Aquatic habitats, *Salinity, Water pollution, Cytological studies, Organic wastes, Chemical wastes.
Identifiers: Berre, Bouches-du-Rhone, Callithamnion-Corymbosum, Ectocarpus-Confervoides-var-confervo, Enteromorpha-Prolifera-ssp-Prolifera, *France, Grateloupia-Filicina, Vaine.

Lakes Berre and Vaine (Bouches-du-Rhone) (France) constitute an aquatic habitat with very specific ecological conditions, especially with regards to salinity, turbidity and pollution. There has been a decrease in the average salinity since 1966 (30-13%), a progressive deposition of silt on the rocky substratum and an increase in the turbidity and pollution (organic and chemical). These changes in environmental conditions led to morphological and cytological changes in some of the algal flora, particularly Grateloupia filicina (Wulfen) O. Agardh, Callithamnion corymbosum (Smith) Lyngbye, Edtocarpus confervoides (Roth) Kjellman var. confervoides, Enteromorpha prolifera (O.F. Muller) J. Agardh ssp. prolifera type I de Bliding.--Copyright 1975, Biological Abstracts, Inc.
W76-07950

PRELIMINARY NOTE ON THE ALGAL POPULATION OF THE SCIOPHILOUS SURFACE BIOTOPES IN THE EXPOSED MODE, OF THE ISLAND OF LINOSA (STRAIT OF SICILY, ITALY), (IN FRENCH),
Naples Zoological Station (Italy).
For primary bibliographic entry see Field 2L.
W76-07952

210PO RADIOACTIVITY IN ORGANS OF SELECTED TUNAS AND OTHER MARINE FISH,
Scripps Institution of Oceanography, La Jolla, Calif. Soledad Marine Radioactivity Lab.
F. Hoffman, V. F. Hodge, and T. R. Folsom.
J Radiat Res. 15(2), p 103-106, 1974.

Descriptors: *Fish, *Marine fish, *Radioactivity, Radioisotopes, Pollutant identification.
Identifiers: Carangidae, Euthynnus-Lineatus, Euthynnus-Pelamis, Mycteroperca-Xenarcha, Polonium-210, Sarda-Chiliensis, Scomber-Japonicus, Scombridae, Seriola-Dorsalis, Serranidae, Thunnus-Alalunga, Thunnus-Albacares, Thunnus-Thynnus, Trachurus-Symmetricus, *Tunas.

Po-210 radioactivities were measured in organs of 10 spp. of oceanic fish (Thunnus alalunga, T. thynnus, T. albacares, Euthynnus pelamis, E. lineatus, Sarda chiliensis, Scomber japonicus, Trachurus symmetricus, Seriola dorsalis and Mycteroperca xenarcha) from 3 families (Scombridae, Caranguidae and Serranidae). The highest activities were consistently found in the pyloric cecal masses or intestinal contents of the fish.--Copyright 1974, Biological Abstracts, Inc.
W76-07962

THE PRIMARY PRODUCTIVITY OF MARINE MACROPHYTES FROM A ROCKY INTERIDAL COMMUNITY,
California Univ., Irvine. Dept. of Population and Environmental Biology.
M. M. Littler, and S. N. Murray.
Mar Biol (Berl). 27(2), p 131-136, 1974.

Descriptors: *Biological communities, *Productivity, California, *Algae, Cyanophyta.

Identifiers: Colpomenia-Sinuosa, Corallina-Officinalis-Var-Chilensis, Egregia-Laevigata, Eisenia-Arborea, Gelidium-Pusillum, Gelidium-Robustum, Gigartina-Canaliculata, Halidrys-Dioica, Hydrolithon-Decipiens, Lithothrix-Aspergillum, Macrocystis-Pyrifera, *Macrophytes, Melobesia-Mediocris, Phyllospadiz-Torreyi, Pseudolithoderma-Nigra, Pterocladia-Capillacea, Rhodoglossum-Affine, Sargassum-Agardhianum, Thallus, Ulva-Californica.

This study represents the 1st report of primary production rates for Southern California intertidal producers. The production rates of 18 marine macrophytes near Wilson Cove, San Clemente Island, are close to those for other marine algal communities. (Macrophytes in order of declining productivity on a thallus-area basis: Gelidium pusillum, Ulva californica, Sargassum agardhianum, Gigartina canaliculata, Gelidium robustum, Egregia laevigata, Halidrys dioica, Phyllospadix torreyi, Lithothrix aspergillum, Phyllospadix torreyi (with Melobesia mediocris), Pterocladia capillacea, Macrocystis pyrifera, (blue-green algae), Colpomenia sinuosa, Rhodoglossum affine, Eisenia arborea, Corallina officinalis var. chilensis, Hydrolithon decipiens, Pseudolithoderma nigra). No apparent relationship was revealed between the productivity of an alga and the division to which it belongs; however, productivity was associated with growth form. Encrusting prostrate forms were the lowest producers in terms of g C/m2/h and g C/g dry weight/h; sheet-like and finely-branched forms showed a greater productivity than coarsely-branched forms. G. pusillum and U. californica had considerably greater production rates than the other algae measured.--Copyright 1975, Biological Abstracts, Inc.
W76-07965

SERUM CONSTITUENTS OF THE MALAYSIAN PRAWNS (MACROBRACHIUM ROSENBERGII) AND PINK SHRIMP (PENAEUS MARGINATUS),
Hawaii Inst. of Marine Biology, Honolulu.
G. H. Balazs, S. E. Olbrich, and M. E. Tumbleson.
Aquaculture. 3(2), p 147-157, 1974.

Descriptors: *Shrimp, *Pink shrimp, Cholesterol, Analysis.
Identifiers: Dehydrogenase, Glucose, Macrobrachium-Rosenbergii, Malaysia, Penaeus-Marginatus, *Prawns, *Serum.

Baseline serum values of newly captured M. rosenbergii and P. marginatus were determined by sequential multiple autoanalysis. Both species have considerable potential for commercial captive culture. Sex differences in serum constituent levels were found within species. Female pink shrimp had higher serum glucose levels than the males. Malaysian prawn males had higher cholesterol levels than females, and the latter had higher levels or activities of urea nitrogen, creatinine and lactic dehydrogenase. Pink shrimp held under laboratory conditions for 10 days had higher levels or activities of serum glucose and alkaline phosphatase and lower levels or activities of serum inorganic phosphorus, total protein, lactic dehydrogenase and glutamic-oxalo-acetic transaminase than pink shrimp sampled immediately after capture.--Copyright 1975, Biological Abstracts, Inc.
W76-07966

LOBSTER NUTRITION: EFFECT ON HOMARUS AMERICANUS OF DIETARY PROTEIN LEVELS,
Fisheries and Marine Service, Halifax (Nova Scotia). Halifax Lab.; Fisheries and Marine Service, Halifax (Nova Scotia). Dept. of Environment.
J. D. Castell, and S. D. Budson.
J Fish Board Can. 31(8), p 1363-1370, 1974.

Descriptors: *Lobsters, *Proteins, *Diets, *Biology, *Fish diets.
Identifiers: *Cornstarch.

Adult American lobsters (H. americanus) were fed artificial diets ranging between 0-60% protein and made isocaloric by adjusting the content of cornstarch. Those fed the highest level of protein were in the best condition; each decrease in protein resulted in a poorer condition of the lobsters. When lobsters were fed diets at the maintenance level of 0.5% of the body weight in food per day, decreasing the dietary protein content resulted in increasing weight loss and decreasing molt incidence, serum protein content, percent edible meat, heart weight, hepatopancreas and gonad weights and increased moisture content of several tissues. Although the serum glucose level was dependent upon the cornstarch content of the hepatopancreas was not affected by dietary starch levels. The glycogen content of the hepatopancreas showed a very large range of values when protein was omitted from the diet. A relationship between serum Ca level and molt cycle was demonstrated. Serum calcium values went from an average of 50 mg% after molting to over 70 mg% 1 mo. before molting.--Copyright 1975, Biological Abstracts, Inc.
W76-07969

PHYTOPLANKTON OF THE TAMPA BAY SYSTEM, FLORIDA,
Texas A and M Univ., College Station. Dept. of Oceanography.
J. T. Turner, and T. L. Hopkins.
Bull Mar Sci. 24(1), p 101-121, 1974.

Descriptors: *Florida, *Bays, *Phytoplankton, Plankton, Sampling, Analysis, Estuarine environments, Nutrients, Plant growth, Nitrogen, Phosphorus, Diatoms.
Identifiers: Ceratium-Hircus, Dinoflagellates, Gonyaulax-Balechii, Skeletonema-Costatum, *Tampa Bay(Fla), Phaed.

Phytoplankton, nutrients and physical factors in the Tampa Bay System were studied by collections taken quarterly from fall 1969, to early summer 1971. Forty-two diatom and 23 dinoflagellate taxa were recorded from sample aliquots. Annual averages of phytoplankton abundance (0.78 to 1.45 x 10 to the 6th cells/l) were intermediate in comparison with other estuaries of Florida and the northwestern Atlantic. Nitrate (2.31 microg-at/l), phosphate (29.16 microgramg/-at/l) and chlorophyll + pheopigments (16.43 mg/m3 were higher than averages for these regions. The principal diatom was Skeletonema costatum, as in other Gulf and east-coast estuaries. The most abundant dinoflagellates were Gonyaulax balechii and Ceratium hircus. Seasonal trends for nutrients varied from area to area in the bay complex and, on the basis of quarterly surveys, were difficult to interpret. Phytoplankton abundance in 1969-1970 was greatest in fall and least in spring in most sections of the bay. Patterns in 1970-1971 were more variable. Regionally, phytoplankton abundance and nutrient levels generally decreased with increasing salinity toward the mouth of the bay in all seasons. Low N : P ratios throughout the year suggest that N is more limiting than P in the Tampa Bay system.--Copyright 1975, Biological Abstracts, Inc.
W76-07973

THE GRADIENT OF SALINITY, ITS SEASONAL MOVEMENT, AND ECOLOGICAL IMPLICATIONS FOR THE LAKE IZABAL-RIO DULCE ECOSYSTEM, GUATEMALA,
Florida Univ., Gainesville. Dept. of Botany.
M. M. Brinson, L. G. Brinson, and A. E. Lugo.
Bull Mar Sci. 24(3), p 533-544, 1974.

Descriptors: *Lakes, *Salinity, *Seasonal, *Ecosystems, *Central America, Bays, Conductivity, Profiles, Water temperature, Primary productivity.
Identifiers: *Guatemala, Lake Izabal, Rhizophora-Mangle, Rio-Dulce, Amatique Bay.

Profiles of conductivity and temperature were measured along a transect of 42 km along the Rio Dulce from Lake Izabal to Amatique Bay, in the coastal lowlands of Guatemala, Central America. Readings were taken 3 times during the dry season between March 22-June 13, 1972. Water conductivity along the transect increased as the dry season progressed. Tides, winds, gravitation forces, a low topographic gradient and low discharge of fresh water at this time of the year are the factors responsible for the upstream movement of high conductivity water. The vertical and horizontal stratification of brackish water disappears with the onset of the wet season. Marine invasions into the lake, and the presence of mature red mangroves (Rhizophora mangle) along the Rio Dulce, are explained in terms of the seasonal appearance of this high conductivity water in the area. Pulses of primary production in the bays and coves surrounding the lake and the consequent availability of concentrated food sources coincident with the occurrence of seasonal oligohaline waters inside the lake, are discussed as the casual factors for marine invasions in tropical lakes.--Copyright 1975, Biological Abstracts, Inc.
W76-07975

EFFECT OF A SUBLETHAL CONCENTRATION OF PHENOL ON SOME BLOOD PLASMA ENZYME ACTIVITIES IN THE PIKE (ESOX LUCIUS L.) IN BRACKISH WATER,
Helsinki Univ. (Finland). Dept. of Zoology.
R. Kristoffersson, S. Broberg, and A. Oikari.
Ann Zool Fenn. 11(3), p 220-223, 1974.

Descriptors: Fish, *Pikes, *Phenols, Effects, *Water pollution effects, *Brackish water, Enzymes.
Identifiers: Blood plasma, Cholinesterase, Esox-Lucius, Lactate, Dehydrogenase, Oxalacetate, Glutamate, Pyruvate, Sublethal doses, Transaminase.

In pike kept for 8 days in brackish water (about 6% S) containing about 5 ppm phenol at 10C, the activities of the plasma enzymes lactate dehydrogenase, glutamate-oxaloacetate transaminase, and glutamate-pyruvate transaminase were significantly elevated. The activity of cholinesterase remained unchanged.--Copyright 1975, Biological Abstracts, Inc.
W76-07977

HEAVY METALS AS TRACE CONSTITUENTS IN NATURAL GROUNDWATERS AND POLLUTED,
Kiel Univ. (West Germany). Geologish-Palaeontologisches Institut und Museum.
For primary bibliographic entry see Field 5A.
W76-07978

PREPARATION OF ALGAE FOR THE GAS CHROMATOGRAPHIC DETERMINATION OF LINDANE, (IN GERMAN),
Hamburg Univ. (West Germany). Institut fuer Hydrobiologic and Fischereiwissenschaft.
For primary bibliographic entry see Field 5A.
W76-07979

THE MERCURY CONTENTS OF FISH FROM CARINTHIAN LAKES, (IN GERMAN),
Bundesanstalt fuer Virusseuchenbekampfung der Haustiere, Vienna (Austria).
W. Krocza, P. Glantschnig, and W. Stoeckl.
Wien Tieraerztl Monatsschr. 61(6/7), p 169-178, 1974.

Descriptors: *Mercury, *Fish, Lakes, Pikes, Perches, Analysis, Pollutants, Effects, Water pollution effects, Pollutant identification.
Identifiers: *Austria(Carinthian Lakes), Muscle, Tissue.

Samples of fish (136) and 9 Carinthian lakes (Austria) were analyzed for total Hg in muscle-tissue. After radioactivation of the samples by thermic neutrons followed by chemical separation the amounts of Hg were estimated by gamma-spectroscopy. Calculations of concentrations were based on the fresh-weight of the tissue. Of 62 cyprinides, none showed values over 0.25 ppm Hg. Of 68 pikes and perches, 4 pikes contained more than 0.5 ppm Hg. Six trouts, taken from 1 lake, yielded an average concentration of 0.08 ppm Hg in muscle. The lakes in question are probably contaminated by airborne Hg. In 1 small lake focal contamination by an unknown source was assumed.--Copyright 1975, Biological Abstracts, Inc.
W76-07981

MERCURY IN SOME MARINE ORGANISMS FROM THE OSLOFJORD,
Oslo Univ. (Norway). Dept. of Marine Zoology.
A. T. Andersen, and B. B. Neelakantan.
Norw J Zool. 22(3), p 231-235, 1974.

Descriptors: *Mercury, *Mollusks, *Crustaceans, *Fish, *Fjords, Geographical regions, Water pollution effects, Aquatic life, Marine animals, Pollutants, Analysis.
Identifiers: Buccinum-Undatum, Carcinus-Maenas, Cardium-Edule, Clupea-Harengus, Cragon-Crangon, Cyprina-Icelandica, Gadus-Morrhua, Modiolus-Modiolus, Mya-Arenaria, Mytilus-Edulis, *Norway, Oslo, Pandalus-Borealis, Pasiphaea-Multidentata, Platichthys-Flesus, Sprattus-Sprattus.

The concentration of Hg was measured in 6 species of mollusks: Mytilus edulis, Cardium edule, Cyprina icelandica, Mya arenaria, Modiolus modiolus, Buccinum undatum; in 4 species of crustaceans: Carcinus maenus, Pandalus borealis, Crangon crangon, Pasiphaea multidentata; and 4 species of fish: Clupea harengus, Sprattus sprattus, Platichthys flesus, Gadus morrhua from the Oslofjord (Norway). The levels of Hg ranged from 0.29-0.84 microg/g dry weight (dw) for mollusks, 0.31-0.39 microg g/g dw for crustaceans, and 0.14-0.71 microg g/g dw for fish. M. edulis was used to study the geographical variation of Hg within the fjord. There was a higher concentration of Hg in the outer fjord. Analyses of various tissues in M. edulis revealed the highest Hg concentrations in the gills. The mean value of Hg in all the species studied was low compared with results from other areas.--Copyright 1975, Biological Abstracts, Inc.
W76-07982

PESTICIDE POLLUTION AND ITS ECOLOGICAL IMPLICATIONS, (IN FRENCH),
Paris-11 Univ., Orsay (France). Laboratoire de Zoologie.
F. Ramade.
Bull Soc Zool Fr. 99(1), p 19-25, 1974.

Descriptors: *Pesticides, Pollutants, Water pollution effects, Biomass, Ecology, Toxicity, Path of pollutants.

Pesticide pollution occurs on a worldwide scale. Pesticides are found not only in field areas directly exposed to application, but also in soil, air and water from remote areas. Like radioactive fallout, these compounds circulate between different regions of the biosphere and are concentrated in the biomass all along trophic chains. Biological effects must be considered at each organization level, not only at cellular, organic and individual ones but also at those of populations and communities. Because man stands at the top of the ecological pyramid he can be exposed to accumulated concentrations of toxic contaminants.--Copyright 1975, Biological Abstracts, Inc.
W76-07983

ALGAL FLORA OF UPPER ISTISU HOT SPRINGS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
N. B. Balashova.
Vestn Leningr Univ Biol 1, p 35-39, 1975.

Descriptors: *Hot springs, *Cyanophyta, Algae, Aquatic plants, Saline water, Water temperature, Effluents, Diatoms, Reservoirs.
Identifiers: Azerbaijan-SSR, *Bacillaripphyta, *USSR(Upper Istisu).

In the hot springs of Upper Istisu (Azerbaijan SSR (USSR)) 16 spp. of Cyanophyta and 14 of Bacillariophyta were determined. The majority of blue-green algae developed in springs with temperatures of 25-47 C. Diatom species were found only in the effluent stream of 1 hot spring at 25C. All the blue-green algae and some diatoms have a characteristic feature-the development in thermal springs. Many of these species are frequently found in saline reservoirs.--Copyright 1975, Biological Abstracts, Inc.
W76-07985

STUDIES OF PARAGONIMUS OHIRAI MIYAZAKI: 1939 AND P. SADOENSIS MIYAZAKI ET AL. 1968 FOUND IN NOTO PENINSULA, ISHIKAWA PREFECTURE: JAPAN, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Lab. of Medical Zoology; and Kyushu Univ., Fukuoka (Japan). School of Health Science.
K. Kawashima, M. Miyahara, I. Tada, Y. Sakaguchi, and Y. Hashiguchi.
Jpn J Parasitol 24(1); p 24-33, 1975.

Descriptors: Crabs, Fish diseases, Shellfish, Snails, Molluscicides.
Identifiers: Angustassiminea-Parasitologica, *Japan(Noto Peninsula), Oncomelania-Minima, Paragonimus-Ohirai, Paragonimus-Sadoensis, Potamon-Dehaani, Sesarma-Dehaani.

In Noto Peninsula, Ishikawa Prefecture, Japan, 349 brackish water crabs (Sesarma dehaani) and 280 fresh water crabs (Potamon dehaani) were investigated for Paragonimus infection. The metacercariae found in S. dehaani were P. ohirai. Adults obtained from albino rats experimentally infected with the larvae were P. ohirai. Field and experimental studies on the snails showed that Angustassiminea parasitologica can serve as the snail host of this fluke. The metacercariae found in P. dehaani were similar to those of P. ohirai, but the former were more spherical in shape than the latter. Pinkish granules were hardly visible in the larvae found in P. dehaani, while in P. ohirai the larvae contained numerous pinkish granules. The metacercariae found in P. dehaani were P. sadoensis. Adults obtained from experimentally infected rats were P. sadoensis. Field and experimental studies showed that Oncomelania minima can be the snail host of this fluke. The 2 spp. Paragonimus show different host preferences in natural conditions, although their morphological features are similar. The interspecific relations between P. ohirai and P. sadoensis are briefly discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-07991

PHENOLOGY AND PRODUCTIVITY OF PISTIA STRATIOTES L. ON THE VOLTA LAKE, GHANA,
Ghana Univ., Legon. Dept. of Botany.
J. B. Hall, and D. U. U. Okali.
J Appl Ecol. 11(2), p 709-725, 1974.

Descriptors: *Productivity, Africa, Lakes, Nutrients, Plant physiology, *Phenology, Plant growth, Seasonal, Viruses, Epidemiology.
Identifiers: *Ghana(Volta Lake), *Pistia-Stratiotes.

Floating enclosures were established in continuous P. stratiotes L. mats on the Pawmpawm arm which forms the southern-most tip of the man-made Volta Lake in Ghana. At 4-wk intervals from July 1971 to July 1972, Pistia samples were removed from the enclosures for subsequent assessment of biomass, density, plant size, community leaf area, flowering and leaf color. Growth rates, leaf area indices and productivity were calculated from these data. Concurrently water samples were taken for measurement of conductivity and pH. From Sept. to Dec. biomass and relative growth rate remained fairly constant, while flowering increased; from Dec. to Feb. biomass and growth rate fell drastically to about 300 g/m2 and -0.05 g/g/week respectively, and leaf yellowness was high; in March and April, the relative growth rate reached its maximum of 0.14 g/g/week, and the abundant vegetative reproduction of young rosettes resulted in high plant density and a low percentage of yellowed leaves; from May to Aug., biomass and relative growth rate declined slowly. Results are discussed in relation to earlier data on Volta Lake water composition, and possible seasonal variation in nutrient supply. Seasonal fluctuations in Pistia are possibly determined by variations in nutrient enrichment of the lake water by inwash from adjacent land, rather than by the incidence of epidemic virus disease as has been previously suggested. The estimated maximum productivity of Pistia on the Volta Lake, about 14.2 g/m2/day, is comparable with figures found for the plant elsewhere.--Copyright 1975, Biological Abstracts, Inc
W76-08036

NEKTON POPULATION DYNAMICS IN THE ALBEMARLE SOUND AND NEUSE RIVER ESTUARIES,
North Carolina Univ., Raleigh. Dept. of Zoology.
J. M. Hester, and B. J. Copeland.
Available from the National Technical Information Service, Springfield, Va 22161, as COM-75-10480, $6.00 in paper copy, $2.25 in microfiche. UNC-SG-75-02, January 1975. 131 p. 26 fig., 4 tab., 45 ref., 1 append. NOAA 03-3-158-40.

Descriptors: *Fish populations, *Animal groupings, *Distribution, *Estuaries, *North Carolina, Varieties, Saline water-freshwater interfaces, Shellfish, Biomass, Spawning, Fish migration, Juvenile growth stage, Fisheries.
Identifiers: *Species diversity, *Albemarle Sound(NC), *Neuse River(NC), Pamlico Sound(NC).

Albemarle Sound, North Carolina, an oligohaline estuary, is dominated by eight fish species. Three populations and two areas were identified. The indigenous population was associated with freshwater. Populations increase in winter due to emigration of the other populations. The migratory population emigrate to mesohaline waters in spring and remain until fall. Anadromous populations migrate through the estuary to tributaries. Young-of-the-year fish entered the sound in summer; most emigrated by late fall. Immigration coincided with increased estuarine peak primary productivity in spring and summer. All populations used the sound as a nursery. Juveniles fed on zooplankton and organic debris. Species diversity indices were low, indicating severe estuarine stress. The Neuse River estuary, a mesohaline system, was dominated by four fish species. The only important population was migratory producing pronounced seasonal fluctions. Spring immigration increased concomitantly with chlorophyll-a readings when it functioned as a nursery area. Low summer oxygen probably encouraged emigration to Pamlico Sound and prevented energy utilization. Few nektonic organisms remained to take advantage of the energy available. In these two estuaries, few species were dominant and varied seasonally; species diversity values were lower and did not fluctuate like other nearby systems. Twenty-three economically important fish species were found. The economic importance of these estuaries is stressed. (Buchanan-Davidson--Wisconsin).
W76-08037

AN EVALUATION OF THE POTENTIAL FOR ECOLOGICAL DAMAGE BY CHRONIC LOW-LEVEL ENVIRONMENTAL POLLUTION BY FLUORIDE,
California Inst. of Tech., Pasadena. Div. of Humanities and Social Sciences.
E. Groth.
Fluoride, Vol. 8, No. 4, p. 224-240, 1975. 2 tab., 74 ref.

Descriptors: *Fluorides, *Environmental effects, *Pollutants, Air pollution, Water pollution, Path of pollutants, Soil contamination, Wildlife, Vegetation, Food chains, Toxicity, Insects, Invertebrates, Mammals, Aquatic life, Birds, *Reviews.
Identifiers: *Biomagnification.

To assess the possible impact of fluoride pollution on natural ecosystems, research on the effects of fluorides on wildlife, plant and animal species is reviewed. Present knowledge is very incomplete, but fluoride meets most, if not all, of the criteria for a pollutant with a major potential ecological impact. Fluoride is a widespread pollutant; it is relatively persistent and is not biodegradable. It is absorbed by a great many organisms and is probably accumulating in food chains even at low levels of exposure. Fluoride possesses high biological activity, with toxic effects to many organisms. The levels of exposure which may occur in the environment appear to be capable of causing adverse effects on some of the wildlife species studied. Information on the potential effects on natural populations and ecological balances is not available. Fluoride may be transformed by some organisms into more toxic organic fluorides; such transformations would have a very serious ecological impact. There are no estimates of safe levels of fluoride for the environment. Research is needed to answer some of these questions and to obtain information for setting standards which will protect ecosystems from damage by fluoride pollution. (Buchanan-Davidson--Wisconsin).
W76-08038

A STUDY OF THE MARINE RESOURCES OF HINGHAM BAY,
H. R. Iwanowicz, R. D. Anderson, and B. A. Ketschke.
Mass Dep Nat Resour Div Mar Fish Monogr Ser. 14. 1-40. Illus. 1973.

Descriptors: *Massachusetts, Marine fish, Bays fish populations, Shellfish, Marine algae, Marsh plants, Water pollution, Bacteria, Pesticides, Marine plants.
Identifiers: Hingham Bay(Mass).

An historical review is given of sport and commercial fisheries; geological and morphometric studies; surface water temperature and salinity measurements; pollution studies including bacteriological and pesticide analyses; determinations of type, status, relative abundance and economic value of shellfish and fish populations; an inventory of common algae and vascular marsh plants and studies on the current status of salt marsh acreage and protection carried out along the Massachusetts coast.--Copyright 1975, Biological Abstracts, Inc.
W76-08039

A SURVEY OF ENVIRONMENTAL FEATURES IN A SECTION OF THE VELLAR-COLERON ESTUARINE SYSTEM, SOUTH INDIA,
Centre of Advanced Study in Marine Biology, Porto Novo (India).
K. Krishnamurthy, and V. Sundararaj.
Mar Biol (Berl). 23(3), p 229-237, 1973.

Descriptors: Estuaries, *Estuarine environment, Asia, *Mangroves, Chlorophyll, Phytoplankton, Zooplankton, Surveys, Productivity.
Identifiers: Acrocalanus, Asterionella, Centropages, Coleroon, Corycaeus, Coscinodiscus, Ditylum, Euterpina, *India, Lucifer, Oikopleura, Oithona, Vellar.

A survey was conducted on Nov. 15th, 1970 in mangrove forests and backwater regions of a section of the Vellar-Coleroon estuarine complex; a total of 19 stations were occupied. Detailed investigations on nutrients, pigments, and plankton were carried out. The following ranges in values were recorded: salinity, 10.40-30.50% parts per thousand; pH, 7.50-8.30; temperature 29.50 -30.50 C; total P, 0.72-3.34 microgram at /l; inorganic phosphate, 0.19-1.59 microgram at /l; ammonia, 0.34-0.36 microgram at /l; nitrite, 0.11-0.25 microgram at /l; nitrate, 2.85-6.94 microgram at /l; silicate, 18.49-134.92 microgram at /l; Dissolved O2 content ranges from 3.69-5.44 ml/l. Chlorophyll a ranged from an undetectable amount to 1.01 mg/m3, chlorophyll b and 0.02-0.85 mg/m3, chlorophyll c from 0-0.41 mg/m3 and carotenoids from 0-0.74 MSPU/m3 (Millispecific plant pigment unit)/m3. The plankton displacement volume ranged from a negligible amount to 3.60 cm3/m3; seston varied between 0.29-0.91 g/l. Phytoplankton was abundant at 3 stations; at other stations zooplankton was abundant. Coscinodiscus, Asterionella and Ditylum were the dominant forms among the phytoplankton; Oithona, Acrocalanus, Euterpina, Centropages, Corycaeus, Lucifer and Oikopleura were dominant among the zooplankton. Phytoplankton and zooplankton populations, as percentage of the total plankton, varied between 3.70 89.00% and between 11-96.30%, respectively. Average gross production values in the mangrove and back-water stations were 7.56 and 3.33 g C/m3/day, and the net production values 6.29 and 2.67 g C/m3/day, respectively.--Copyright 1975, Biological Abstracts, Inc.
W76-08040

LONG-TERM CHANGES IN THE PLANKTON OF LAKE TYRIFJORD, NORWAY,
Kongeliege Norske Videnskabers Selskab, Trondheim. Museet.
For primary bibliographic entry see Field 2H.
W76-08042

LABORATORY EFFICACY OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) AS A LAMPRICIDE,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
V, K. Dawson, K. B. Cumming, and P. A. Gilderhus.
Investigations in Fish Control, No. 63, Department of the Interior, Fish and Wildlife Service, Washington, D.C. 1975. 13 p., 7 tab., 20 ref.

Descriptors: *Toxicity, *Pesticides, *Larval growth stage, Laboratory tests, *Embryonic growth stage, *Lampreys, Hydrogen ion concentration, Hardness(Water), Temperature, *Piscicides, Aquatic animals, Water properties, Lethal limit.
Identifiers: *Lampricides, *TFM, Sea Lamprey, American Brook Lamprey, Petromyzon marinus, Lampetra lamottei.

The lampricidal activity of 3-trifluoromethyl-4-nitrophenol (TFM) was tested under controlled laboratory conditions to evaluate factors which may influence the efficacy of the chemical. TFM was tested at temperatures between 7 and 22 C, total water hardness from 12 to 300 mg/l as CaCO3 and pH's of 6.5, 7.5, 8.5, and 9.0. TFM is more effective against larvae of the sea lamprey (Petromyzon marinus) than against embryos and prolarval stages. It is more effective against larvae of sea lampreys than against larvae of the American brook lamprey (Lampetra lamottei). Temperature does not influence the efficacy of TFM which decreases in hard water, especially at high pH's. Toxicity of TFM is affected more by pH than any other factor. TFM is significantly more effective against free swimming larvae than against those in burrows. (Katz)
W76-08063

EFFECTS OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) ON DEVELOPMENTAL STAGES OF THE SEA LAMPREY,
Bureau of Sport Fisheries and Wildlife, Millersburg, Mich. Hammond Bay Biological Station.
G. W. Piavis, and J. H. Howell.
Investigations in Fish Control, No. 64, Department of the Interior, Fish and Wildlife Service, Washington , D. C. 1975. 8 p., 3 ref., 1 fig., 1 tab.

Descriptors: *Piscicides, Pesticides, *Toxicity, *Lampreys, Laboratory tests, Immature growth stages, *Pesticide toxicity, Larvae, Mortality, Hatching, *Pathology, Fishkill.
Identifiers: *Sea Lamprey, *TFM, Hemoglobin, Petromyzon marinus.

Sea lampreys (Petromyzon marinus) at eighteen developmental stages from zygote through larva were exposed for 24 hours to a 10 mg/l (active ingredient) solution of TFM at 18 C. Embryonic development, incidence of abnormalities, and mortality in test animals were compared with unexposed controls. Exposed embryos in the first eight stages showed no immediate effects. However, the number of viable larvae produced was drastically reduced, incidence of abnormalities increased, hatching was delayed and hemoglobin production was inhibited or lacking. These findings suggest that treatment of streams with TFM at the customary rates probably does not effect a complete kill of sea lampreys in all developmental stages. (Katz)
W76-08064

ACCUMULATION AND LOSS OF RESIDUES OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) IN FISH MUSCLE TISSUE: LABORATORY STUDIES,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeaster Fish Control Lab.
J. B. Sills, and J. L. Allen.
Investigations in Fish Control, No. 65, Department of the Interior, Fish and Wildlife Service, Washington, D.C. 1975. 10 p., 5 tab., 4 ref.

Descriptors: *Pesticide residues, Pesticides, *Piscicides, Laboratory tests, *Bioassay, Water quality control, Hardness(Water), *Absorption, *Gas chromatography, Freshwater fish, Rainbow trout, Channel catfish, Brown trout, Lake trout, White bass, Analytical techniques, Chemical analysis, Hydrogen ion concentration, Carp, Bass, Trout, Sunfishes.
Identifiers: *TFM, *Tissue analysis(Fish), *Bioaccumulation, Morone chrysops.

Residues of 3-trifluoromethyl-4-nitrophenol (TFM) in muscle tissue of eight species of fish, after exposure under controlled conditions, were determined by gas chromatography. The mean concentration of TFM residue in samples from various species immediately after a 12 hour exposure to 1-4 mg/l of TFM ranged from 0.02 to 5.09 micrograms/gram depending on pH, temperature, hardness of test solutions, and TFM concentration. Residues decreased rapidly after the fish were removed from the test media, and were near the limit of detection (0.01 micrograms/gram) within 24 hours. (Katz)
W76-08065

RESIDUES OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) IN A STREAM ECOSYSTEM AFTER TREATMENT FOR CONTROL OF SEA LAMPREYS,
Bureau of Sport Fisheries and Wildlife, :a Crosse, Wis. Fish Control Lab.
P. A. Gilderhus, J. B. Sills, and J. L. Allen.
Investigations in Fish Control, No. 66, Department of the Interior, Fish and Wildlife Service, Washington, D. C. 1975. 7 p., 3 tab., 10 ref.

Descriptors: *Pesticide residues, Aquatic plants, *Absorption, Pesticides, Sampling, *Piscicides, *Algae, *Path of pollutants, *Rainbow trout, Bot-

tom sampling, Water pollution sources, Invertebrates, Lampreys, Water quality control, Fish, Bottom sampling, Pest control, *Michigan.
Identifiers: *TFM, Tissue analysis, Bioaccumulation, *Lampricides, Au Gres River(Mich).

Samples of water, bottom soil, plants, invertebrates and fish were collected from two stations on the East Au Gres River in Michigan. Collections were made before, during, and after treatment of the stream with 3-trifluoromethyl-4-nitrophenol (TFM) for control of sea lampreys (Petromyzon marinus). Residues were highest in samples collected as the last portion of full-strength TFM flowed past each station, and were much higher in water and organisms than in the bottom soil. Fish retained higher residues than other organisms 24 hours after treatment (up to 6 micrograms/gram). Residues decreased to less than 0.08 micrograms/gram at 96 hours after treatment. Residues in soil were among the lowest found in all samples. (Katz)
W76-08066

IMPORTANCE OF WATER QUALITY IN THE USE OF LARGE VOLUMES OF WATER FOR CONDENSER COOLING IN POWER STATIONS,
Bhabha Atomic Research Centre, Bombay (India). Chemistry Div.
For primary bibliographic entry see Field 5B.
W76-08070

A FIELD EVALUATION OF THE EFFECTS OF HEATED DISCHARGES ON FISH DISTRIBUTION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. R. Stauffer, Jr., K. L. Dickson, and J. Cairns, Jr.
Water Resources Bulletin, Vol. 10, No. 5, p 860-876, October 1974. 8 fig, 5 tab, 34 ref.

Descriptors: *Thermal pollution, *Heated water, Effects, Fish, Powerplants, Water temperature, Sampling, Evaluation, Water pollution effects.
Identifiers: Avoidance, Field study, *Fish distribution.

Studies were conducted to determine the distribution of fish in the New and East Rivers in relation to thermal discharges from Appalachian Power Company's fossil fuel plant at Glen Lyn, Virginia. Over 15,300 specimens representing 41 species were collected with seines, electrogear and rotenone at six sampling locations from February 1973 to October 1973. Sampling frequency was designed to evaluate the effects of ambient temperature upon preferred temperature. Diversity indices were calculated for each location. There was a slight decrease in the diversity indices for those stations located in the thermal discharge. Condition coefficients calculated for Notropis albeolus Jordan, Notropis rubellus Agassiz, Notropis spilopterus Cope, Ictalurus punctatus Rafinesque, and Etheostoma blennioides Rafinesque were found to be significantly ($p = .05$) lower in the thermal discharge for all species tested except E. blennioides. Temperatures were plotted against frequency of capture to determine a particular species temperature selection from field data and indicated that: (1) some species avoided high temperatures (i.e., Campostoma anomalum Rafinesque); (2) some species were attracted to high temperatures (i.e., Ictalurus punctatus; and (3) some species distribution was not affected by temperatures (i.e., Notropis spilopterus). (Bell-Cornell)
W76-08088

OCCURRENCE AND OUTFLOW OF ZOOPLANKTON IN THE KIEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
Y. Y. Tseeb, and N. G. Revenko.
Gidrobiol Zh. 9(2), p 60-68, 1973.

Descriptors: *Zooplankton, *Reservoirs, Biomass, Seasonal, Bacteria, Phytoplankton, Crustaceans, Tributaries.
Identifiers: Dreissena, Kiev, Rotatoria, *USSR(Ukrainian-SSR).

The zooplankton biomass increase in the principal Dnieper tributaries (Upper Dnieper, Pripyat' and Teterev) and its outflow to the tail-water of the Kiev Reservoir (Ukrainian SSR, USSR) was studied in 1971. The main sources of zooplankton are the Upper Dnieper (3581 t(tons), or 87%) and the Pripyat' (474 t or 11.6% of the total biomass inflow). The incoming zooplankton was mainly Rotatoria (97% of total biomass). Zooplankton outflow from the reservoir (27,048 t) is 6.5 times larger than inflow, and shows seasonal changes in composition: Cladocera and Dreissena larvae predominate. The seasonal dynamics of gain and outflow in the reservoir are considered. In the total gain, the phytoplankton rate reaches 62%; bacterioplankton, 36%; and zooplankton, 2%. In the reservoir outflow the relative rates are quite different: bacterioplankton, 47%; phytoplankton, 36%; and zooplankton, 17%. This affects plankton formation in the lower reservoirs.--Copyright 1976, Biological Abstracts, Inc.
W76-08090

5D. Waste Treatment Processes

REMOVAL OF CESIUM FROM SAVANNAH RIVER PLANT WASTE SUPERNATE,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
J. R. Wiley, and R. M. Wallace.
Available from the National Technical Information Service, Springfield, Va 22161 as DP-1388, $3.50 in paper copy, $2.25 in microfiche. DP-1388, July 1975, 19 p, 8 fig, 3 tab, 7 ref. AT(07-2)-1.

Descriptors: *Water pollution, *Waste water treatment, Laboratory tests, On-site tests, *Cesium, Separation techniques, Chemistry, *Ion exchange.
Identifiers: Savannah River Plant(SC).

Synthetic and actual wastes were used in a process for separation and concentration of Cs137 from Savannah River Plant waste supernate by the two-column Duolite ion exchange process. In tracer-level studies, Duolite resin efficiently sorbed cesium from a solution with a composition expected for the plant process. The resin can be cycled repeatedly without damage. In column tests using actual waste supernates, greater than 99.99% of the Cs137 was removed. Cs137 from the Duolite columns was sorbed on zeolite for final solidification in concrete or glass. The overall volume reduction factor from cesium-salt solution to cesium-zeolite product is about 1400. Although direct sorption of cesium on zeolite is feasible, it would generate 40 times more cesium-zeolite than would be produced by the Duolite process. (Chilton-ORNL)
W76-07479

THE ECOLOGICAL BEHAVIOR OF PLUTONIUM AND AMERICIUM IN A FRESHWATER ECOSYSTEM: PHASE II, IMPLICATIONS OF DIFFERENCES IN TRANSURANIC ISOTOPIC RATIOS,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5C.
W76-07480

HIGH GRADIENT MAGNETIC SEPARATION, A TECHNOLOGICAL BREAKTHROUGH IN WATER PURIFICATION,
Fermon Tanning Co., Boston, Mass.
L. Riese.
The Leather Manufacturer, Vol. 91, No. 9, p 21-22, 28, September, 1974. 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Separation techniques, Tannery wastes, Magnetic studies, Water purification, Filtration.
Identifiers: *Magnetic filtration.

A description of the magnetic filtration techniques for separating water contaminants in tannery effluents is given. The important features of the magnetic filtration process include: the magnetic filter which consists of a filamentary matrix of finely divided ferromagnetic material such as steel wool in a vessel located in the center of a strong electromagnetic field; magnetic seeding by adding finely divided particles of a paramagnetic material and a flocculating electrolyte to form a fluffy coagulant around each contaminating particle; and, the removal of the solids which occurs when the slurry formed by the seeding passes through the magnetized filter and the fluffy mass is magnetically attracted to the steel wool. Backwashing is used to separate the fluffy mass from the steel wool into a separate container. A series of cylical devices are utilized in a continuous system of filtration and backwashing. The concentrated backwashed material can then be handled more efficiently by conventional methods such as filter pressing. Advantages of this system are a high speed of filtration and a relatively small area required as well as lower capital and operating costs per gallon. (Orr-FIRL)
W76-07498

ACID STRIP MINE LAKE RECOVERY,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-07499

DISPOSAL OF LIQUID WASTES BY CHEMICAL FIXATION,
For primary bibliographic entry see Field 5E.
W76-07500

OZONE IN DRINKING WATER PREPARATION (OZON IN DER WASSERAUFBEREITUNG),
For primary bibliographic entry see Field 5F.
W76-07501

DEWATERING OF SLUDGES GENERATED IN THE TREATMENT OF WASTE WATERS GENERATED IN REFINERIES (COMPORTAREA LA DESHIDRATARE A NAMOLURILOR PROVENITE DE LA TRATAREA APELOR REZIDUALE DIN RAFINARII),
R. Zamfirache, and E. Dacin.
Petrol si Gaze, Vol. 25, No. 6, p 328-332, 1974. 5 fig, 1 tab, 8 ref.

Descriptors: *Sludge treatment, *Dewatering, *Industrial wastes, *Filtration, Coagulation, Design criteria, Equipment, *Waste treatment.
Identifiers: *Refinery residual waters, Calcium oxide, Iron sulfate.

A description of the way sludges react to dewatering by filtration is provided by the means of two parameters, specific resistivity to filtration and the compressibility coefficient. Specific resistivity can be as high as 100 times 10 to the tenth power cm/gram. The dewatering characteristics of these sludges must be improved by treatment with coagulants. Conditioning with mineral coagulants, such as calcium oxide and iron sulfate, reduces the specific resistivity of the sludges down to 10-20 times 10 to the tenth power cm/gram, or 10% of the initial value. Using a mixture of calcium oxide and ferrous sulfate in premeasured quantities is more efficient than using calcium oxide alone. The specific resistivity to filtration and the compressibility coefficient are sufficient criteria for selecting specific equipment to be used for filtration dewatering of the sludges generated in the treatment of refinery residual waters. (Takacs-FIRL)
W76-07502

ECONOMY IN THE TREATMENT AND DISPOSAL OF PICKLING EFFLUENTS (EINSPARUNGEN BEI DER BEHANDLUNG UND BESEITIGUNG VON BEIZEREIAB-WASSERN),
G. Woltersdorf.
Metalloberflaeche, Angewandte, Elektrochemie, Vol. 28, No. 5, p 168-169, 1974. 2 ref.

Descriptors: *Metals, *Industrial wastes, *Waste water treatment, Economics, Aeration, Oxidation, Chemical precipitation, Lime, Sludge treatment, Waste disposal.
Identifiers: Pickling shop-generated wastes, Metal surface-treatment.

Possibilities for cost reductions in the treatment and disposal of pickling shop-generated waste waters in the metal surface-treatment industry are described. While small quantities of waste acids are neutralized with sodium hydroxide, this expensive chemical can be replaced by slaked lime when large amounts of waste acids are to be treated. Used iron mordants are aerated until all ferrous hydroxide is transformed into ferric hydroxide. To reduce the aeration tank volume and the aerator capacity, the dilute rinsing water is neutralized in a flow-through process, while the used mordants generated periodically are neutralized in a batch process. The bivalent iron present in the used mordant does not have to be oxidized quantitatively if the precipitation is conducted at high pH values, and the decanted liquid and the filtrate from the sludge separation unit are combined with the rinsing water. The residual amount of ferrous hydroxide is too small to require prolonged aeration, and the slaked lime is utilized completely for the neutralization of the rinsing water. To improve the sludge dewatering, the used mordants are diluted with dilute sludge from the neutralization unit. The sludge precipitated during the subsequent alkalization has high solid content, and is filtered more easily. (Takacs-FIRL)
W76-07503

TANNERY EFFLUENT,
Canada Packers Ltd., Toronto (Ontario).
J. G. Greifender.
Journal of the American Leather Chemists Association, Vol. 69, No. 10, p 452-459, October, 1974. 35 fig.

Descriptors: *Tannery wastes, *Waste water treatment, Separation techniques, Lagoons, Lime, Solids removal, Industrial wastes, Waste disposal.

Effluent processes used at the Beardmore Tannery, Ontario, are described. The first step involves segregation and grouping of the various effluent streams before treatment. The tannery segregates cooling water, salt water, beamhouse effluent, mixed effluent, and 'black water'. The cooling water needs no treatment and is diverted into a small creek. The salt water is screened over a vibrating separator and then pumped to a lagoon. The beamhouse effluent consists of the spent unhairing liquors and rinses. Waste water from the hair-saving limes is screened over a rotating perforated drum to remove long hair and then sent through a settling box to remove heavy suspended solids. Coarse solids are removed by a traveling belt screen and the screened effluent is pumped to a mixing tank. Flue gas treatment is used to remove most of the sulfides from the beamhouse effluent and also to reduce the pH from an average of 12.5 to 8.5. The mixed effluent contains the final effluent from the flue gas treatment in addition to the effluents from bating, pickling, chrome tanning, coloring, fatliquoring, and finishing. The mixed effluent is treated by primary settling in a mechanical clarifier. The primary sludge is pumped out to a drying facility and the clarified effluent is pumped to an aerated lagoon. The stabilized effluent from the lagoons is sprayed on grassland. The 'black water' stream contains the effluents from the vegetable tanyard scrubhouse, curry, and sole leather finishing. It is screened over a rotating perforated drum and pumped into the same lagoon holding the salt water. The water from this lagoon is disposed of over a field. (Orr-FIRL)
W76-07504

ENGINEERING METHODS OF PROCESS SOLUTIONS IN THE TREATMENT OF TANNERY EFFLUENTS,
National Research Inst. for Shoe and Allied Industries, Gottwaldov (Czechoslovakia).
J. Ludvik, K. Jansky, J. Boehm, and S. Siska.
The Journal of the American Leather Chemists Association, Vol. 69, No. 10, p 438-451, October, 1974. 6 fig, 1 tab, 14 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Tannery wastes, *Biological treatment, Sludge treatment, Mathematical studies, Filtration, Chemical engineering.

Bioengineering and chemical engineering methods used for the solution of some processes involved in tannery effluents purification were studied. Special attention was paid to biological treatment and sludge handling. The discussion of biological treatment contains an analysis of the fundamental processes occurring during the purification by activated sludge, such as substrate decomposition, mixed culture production, and oxygen consumption. Mathematical formulae involved in the individual processes and examples of graphical solutions for the particular case of tannery effluents are given. The sludge handling section provides a methodical analysis of the thickening and filtration processes. The importance of the relation between the sedimentation and thickening rate and the sludge concentration, and of the graphical estimation of the thickening tank loading is explained. An example is given of the primary and secondary sludge flow curves for the tannery effluent. Filtrability is discussed according to the Coackley and Eckenfelder methods, and an example of the technological results of vacuum and pressure filtration of the heat-treated sludge is presented. (Orr-FIRL)
W76-07505

RECENT INVESTIGATIONS INTO THE DISPOSAL OF TANNERY WASTE WATER,
Instituut TNO voor Leder en Schoenen, Waalwijk (Netherlands).
P. J. Van Vlimmeren, and A. J. J. Van Meer.
The Leather Manufacturer, Vol. 91, No. 8, p 24-29, August, 1974. 7 fig, 11 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Tannery wastes, Chemical wastes, Chemical oxygen demand, Filtration, Sludge, Sulfides, Recycling, Waste disposal.
Identifiers: Unhairing operations, Chromium, Oxidation ditches.

Highlights of the work done on tannery waste water treatment and effluent quality by the Institute for Leather and Shoe Research, TNO, Waalwijk, Holland, and new developments in this area are presented. Reductions in the amount and degree of pollution of the effluent have been accomplished by the introduction of batch washing to replace continuous washing with a lattice door and the introduction of automatic drums and hide processors. Hair-saving unhairing methods are ideal means for the reduction of pollution from the beamhouse but need further refinement to become economically feasible. A new approach to the reduction of the pollution from the beamhouse involves conducting unhairing in the first soaking liquid. This method greatly lowers the COD of the effluent and produces a sludge with good dewatering and filtering properties. The catalytic oxidation of sulfides by aeration after the addition of manganous salt is a viable method for the treatment of sulfide containing effluents. The method for treating chromium containing wastes now under investigation by the Institute is the precipitation of chromium salts in residual chrome tanning baths followed by filtration and reuse after dissolving the precipitate with acids. The oxidation ditch system is also a solution for the problem of treating tannery waste water at reasonable costs. (Orr-FIRL)
W76-07506

CONTROL OF LIQUID EFFLUENTS FROM CHEMICAL/PETROCHEMICAL PLANTS,
Watson (J. D. and D. M.), London (England).
J. M. Sidwick, and D. W. Hayward.
Chemistry and Industry, No. 19, p 756-761, October, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Reviews, Chemical industry, Biological treatment, *Oil wastes.
Identifiers: Chemical treatment, Physical treatment.

The chemical and petrochemical industries use large volumes of water in their processes for washing down and cooling purposes. The large volume of contaminated waste water produced by these plants varies in pollutional impact; the waste streams may be acidic, alkaline, hot, toxic, may contain large volumes of oil or other suspended matter, or may exert a high biochemical or chemical oxygen demand. A categorization and general approaches to principal treatment problems of chemical and petro-chemical wastes are given. An important part of any waste treatment and disposal problem is to try to minimize waste loads at the source by process changes and/or process controls. The possibility of segregating waste streams and of discharging the non-toxic or relatively non-toxic wastes to the environment or to a municipal treatment plant should always be considered. Treatment methods discussed include: physical treatment such as free oil removal, solids separation, and heating, electro-flotation and dissolved air flotation; chemical treatment such as pH control, chemical flocculation, and chemical oxidation; and, biological treatment with suitably conditioned bacteria under aerobic and anaerobic conditions in biological filters, activated sludge systems, or stabilization ponds. Activated carbon treatment, ion exchange methods, dialysis, electrodialysis, electrophoresis, reverse osmosis, and ultrafiltration are also briefly mentioned. It is stressed that every particular problem must be considered individually. (Orr-FIRL)
W76-07507

FLAME TREATMENT OF WASTE WATERS CONTAINING ORGANIC CHLORINE AND SULFUR IMPURITIES,
A. P. Shurygin, and M. N. Bernadiner.
International Chemical Engineering, Vol. 14, No. 4, p 618-621, October, 1974. 2 tab, 4 ref. From: Khimicheskaya Promyshlennost, No. 9, p 27-28, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Chemical industry, Neutralization, Cyclones, *Sulfur compounds, Sodium compounds, Salts, *Chlorine.
Identifiers: *Flame treatment, Hydrogen chloride.

The flame treatment of waste waters containing organic chlorine and sulfur impurities is discussed. Sulfur dioxide and hydrogen chloride are the usual products of combustion of hydrogen chlorine and sulfur dioxide and are undesirable for sanitary and corrosive reasons. However, it is thermodynamically possible to add sodium hydroxide to the waste water and produce the non-toxic mineral salts, Na_2SO_4 and NaCl, from combustion. Experimental investigations were conducted in a laboratory cyclone apparatus to study the feasibility of neutralizing the toxic gaseous products and to determine the optimal parameters for the process. Almost complete combustion of the organic sulfur and chlorine compounds was obtained in the cyclone chamber under the following condi-

tions: temperature of effluent gases no higher than 990 C; excess air coefficient between 1.06 and 1.10; specific loadings of the cyclone chamber volume with treated waste water between 0.9 and 1.0 ton/cu m hr; and, spraying quality characterized by an average median drop diameter of 170-280 micrometers. This method for the neutralization of toxic gaseous materials in a high-temperature flame has been utilized in many facilities for the flame treatment of waste waters from chemical plants. (Orr-FIRL)
W76-07508

SECONDARY TREATMENT OF WASTE-WATER FROM SYNTHETIC RUBBER PRODUCTION,
Firestone Tire and Rubber Co., Akron, Ohio.
F. G. Troppe.
Rubber Chemistry and Technology, Vol. 47, No. 4, p 932-948, September, 1974. 13 fig, 4 tab, 14 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Neutralization, Coagulation, Flocculation, Biological treatment, Sludge, Costs, *Sewage treatment.
Identifiers: Synthetic rubber production.

A nine month study was conducted of the treatment of wastes resulting from synthetic rubber production at the Firestone Synthetic Rubber and Latex Company's Lake Charles, Louisiana, plant. The waste water was characterized by the presence of salt brine, dilute acid wastes, boiler blowdown, dilute latex, and coagulated rubber solids. Influent concentrations were BOD equal to 72 mg/liter, COD equal to 447 mg/liter, and suspended solids (SS) equal to 197 mg/liter. The treatment processes included neutralization, coagulation, flocculation, primary clarification, and sludge impoundment. Average reductions of 84.2% for BOD and 85.2% for SS were obtained. Conclusions reached as a result of the study included: a completely mixed aerated lagoon was effective in removing oxygen consuming pollutants; dissolved air flotation was the effective method for producing a high-quality effluent; chemical treatment could remove colloidal materials and produce an effective floc for initial and final dissolved air flotation clarification; final dissolved air flotation clarification was necessary to achieve a high-quality effluent and to prevent sludge auto-oxidation; the waste water was amenable to rapid biological oxidation; a retention time of approximately one day in the aerated lagoon produced the maximum BOD reductions; and the average sludge generation was 6.34 gallons/1000 gallons of waste water treated. The total project cost more than $2,000,000, of which about 25 percent was used to separate process waste water from storm water. The average costs for operation, maintenance and depreciation were $0.50 per 1000 gallons of treated waste water.(Orr-FIRL)
W76-07509

SECONDARY PLANT SHOEHORNED INTO SMALL SPACE,
Eastman Kodak Co., Rochester, N. Y. Utilities Div.; and Eastman Kodak Co., Rochester, N. Y. Waste Disposal Dept.
J. M. Lindsley.
Water and Wastes Engineering, Vol. 11, No. 10, p 18-21, October, 1974. 5 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Trickling filters, Aeration basins, Odor, Biochemical oxygen demand.
Identifiers: *Photographic industry wastes.

Eastman Kodak Company's utilities division at Kodak Park, Rochester, New York, is the company's primary photographic film, paper and chemical manufacturing complex. The waste water produced by the complex contains a wide variety of industrial wastes. The space available for a secondary treatment plant was only about 10% of the land area normally required. The constraints required that innovative engineering and unusual features be incorporated in the treatment plant design. The unusual features include: the use of both trickling filters and aeration basins to perform secondary treatment; common walls between aeration and clarification basins; distribution ports in those walls rather than the customary center-column distributors; and, the rotating sludge collectors and high rate of flow over the weirs. Storm flow will be handled by a two million gallon standpipe for storage of excess flow rate over 54 mgd. Some primary treatment will be provided in the standpipe. Odors associated with the plant's operation are controlled by burning the odor-causing gasses at 1100 F. Currently, advanced treatment technologies and methods to reduce the BOD load in-plant, at the source, are being investigated. (Orr-FIRL)
W76-07510

METHOD FOR TREATING SOLUTIONS CONTAINING CYANOHYDRINS,
Establissements Kuhlmann, Paris (France). Produits Chimiques.
P. Colin.
United States Patent 3,835,047. Issued September 10, 1974. Official Gazette of the United States Patent Office, Vol. 926, No. 2, p 609, September, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Patents, Toxicity, Chemical reactions, Biodegradation.
Identifiers: *Cyanohydrins, Hydrogen peroxide.

A patent has been issued for a method of treating aqueous solutions containing cyanohydrins. The resulting solution is made non-toxic by reacting the cyanohydrins with hydrogen peroxide to produce biodegradable oxamides. A similar method is also described for rendering solutions containing a metallic salt of hydrocyanic acid non-toxic. The cyanides contained in solution are reacted with carbonyl compounds and thereby converted to the corresponding cyanohydrin; the cyanohydrins are then reacted with hydrogen peroxide to form biodegradable oxamides. (Orr-FIRL)
W76-07511

ACID DRAINAGE CONTROL AND WATER TREATMENT AT HEATH STEELE,
Heath Steele Mines Ltd., Newcastle, (New Brunswick).
E. Busse.
Canadian Mining and Metallurgical Bulletin, Vol. 67, No. 751, November, 1974. 5 fig, 5 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Acid mine water, Heavy metals, Toxicity, Salmon, Environmental effects, Mine drainage, Costs, Chemical precipitation, *Canada.
Identifiers: Salmon migration, Miramichi River(Canada).

Heath Steele Mines Limited, New Brunswick, Canada, produces lead, zinc, and copper flotation concentrates from complex massive sulfide ores. Acid drainage from the mines was contaminating the Northwest Miramichi River and harming the salmon migration in the stream. The acid drainage was caused by underground and surface water contacting metal sulfides, becoming acidic and acquiring dissolved heavy metals. Previous attempts to treat the mine water and to collect the contaminated surface drainage water were insufficient. To meet governmental requirements, a comprehensive water pollution abatement program was started early in 1970 and became fully operational by the fall of 1972. Areas with contaminated surface drainage were identified and isolated. The water from these areas is collected, together with the water from underground workings and pumped to the tailings disposal area. It is then mixed with the mill tailings and hydrated lime to precipitate the dissolved metals and to retain the metal hydrates and the tailings solids. Removal of 99.9% of the copper and zinc is achieved. The average metal toxicity in the Northwest Miramichi River has been reduced by 83 percent and peaks have been reduced by 92 percent. Control of drainage from the isolated contaminated areas is good; no escape of contaminated water from these areas to fresh water streams has been detected. The water quality of affected streams has improved substantially and the salmon migration has noticeably increased during the past two years. Capital cost of the project was $2.5 million. The current annual operating costs are $0.20 per ton of ore. (Orr-FIRL)
W76-07512

PRETREATMENT PROVIDES CONSTANT EFFLUENT QUALITY,
Syracuse Univ., Syracuse, N.Y. Dept. of Civil Engineering.
R. C. Faro, H. L. Kartiganer, A. Schneider, and D. Albano.
Water and Wastes Engineering, Vol. 11, No. 10, p 52-55, October, 1974. 2 fig, 6 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Pre-treatment(Water), Textiles, Municipal wastes, Lagoons, Biochemical oxygen demand.
Identifiers: Combined municipal-industrial wastes, Flow equalization.

The pretreated effluent from the Majestic Weaving company, Cornwall, New York, is purified in combination with municipal wastes at the Town of New Windsor's municipal treatment plant. An agreement between the town and the mill requires the mill to pretreat its waste water and equalize the flow before discharge to the municipal system, limits the mill to a daily discharge of 1.25 million gallons, and requires that the mill pay a proportional share of the costs of waste water treatment plant expansion, interceptor sewer construction, and plant operation and maintenance. Pretreatment at the mill consists of two completely-mixed, deep, aerated lagoons. The lagoon system is sized to produce an effluent BOD of less than 350 mg/liter under the most critical winter flow design conditions of 1.25 mgd. The first year of operation has demonstrated the following advantages of this system: it is reliable and relatively trouble-free; it achieves a constant and predictable effluent quality; equalization and treatment can be performed in the same unit process due to the long lagoon detention time; the equalization storage duration of 24 hours allows the municipal plant operator the flexibility of choice in industrial effluent receipt, thus maximizing removal efficiency and minimizing risk of system upset; solids handling or sludge removal facilities are not required at the pretreatment plant since these are released to the municipal facility; capital construction costs were less than those for comparable pretreatment processes; and operation reliability was obtained with expenses limited to power, labor and maintenance supplies. (Orr-FIRL)
W76-07513

WASTES MAY NOT BE A TREAT FOR PRETREATMENT.
Chemical Week, Vol. 115, No. 15, p 27, 30, October 9, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Pre-treatment(Water), Municipal wastes, Chemical wastes, Organic compounds, Biological treatment.
Identifiers: Combined municipal-industrial wastes, Chemical treatment.

Although combined treatment of municipal and industrial wastes is strongly advocated, the pretreatment necessary may make this an infeasible procedure for chemical wastes. The problems as-

sociated with combining municipal and organic chemical industrial wastes are discussed. For example, introduction of a readily degradable organic waste water into an activated sludge plant may require readjustment of organic loading. In another case, while the COD in domestic sewage is primarily suspended and colloidal and therefore insensitive to temperature, soluble industrial waste waters require a biological removal mechanism that is affected by temperature, resulting in a need for adjustment for low winter temperatures. Levels of necessary pretreatment are higher for discharge of industrial wastes to a physical-chemical treatment plant than to a biological treatment plant. Types of possible pretreatment to facilitate joint municipal-industrial plants include evaporation, addition of lime, freezing, or membrane processes, as well as a recommendation that organic chemical manufacturing processes be modified to reduce the quantity of waste water and treatment inhibitors produced. While some organic chemical waste streams can never be treated together with municipal wastes because of their high toxicity levels, more joint treatment may be possible if organic chemical plants implement adequate pretreatment plants. (Orr-FIRL)
W76-07514

JOINT BIOLOGICAL PURIFICATION OF DOMESTIC AND INDUSTRIAL WASTE WATERS (SOVMESTNAYA BIOLOGICHESKAYA OCHISTKA KHOZYAYSTVENNOBYTOVKH I PROIZVODSTVENNYKH STOCHNYKH VOD),
V. G. Mitereva, M. A. Luganskiy, I. K. Penke, M. A. Tomas, and I. S. Mal'kova.
Vodosnabzheniye i Sanitarnaya Tekhnika, No. 10, p 18-20, 1974. 2 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Biological treatment, Domestic wastes, Aeration, Biochemical oxygen demand, Sedimentation.
Identifiers: Combined municipal-industrial wastes.

A process for the joint biological purification of domestic and industrial effluents is described. Following preliminary sedimentation, the mixed waste water is aerated for 18 hours in a first stage, and for another 30 hours in a second stage aerator. The specific air consumption is 50 cu m/cu m in the first stage, and 40 cu m/cu m in the second stage. The air consumption in the regenerator amounts to 70 cu m/cu m. The quantity of the circulation sludge amounts to 70% in the first stage, and to 100% in the second stage of the aerator. This biological treatment results in a purified effluent with a BOD level not exceeding 20 mg/liter. (Takacs-FIRL)
W76-07515

AN INVESTIGATION INTO THE PRETREATMENT AND EFFECT OF AN INDUSTRIAL WASTE WATER DERIVED FROM THE MANUFACTURE OF AZO DYES UPON THE ACTIVATED-SLUDGE PROCESS,
Prudhoe Water Pollution Control Works (England).
A. Tong, and R. A. Young.
Water Pollution Control, Vol. 73, No. 5, p 584-588, November, 1974. 3 fig, 4 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Dyes, Chemical wastes, Activated sludge, Color, *Pre-treatment(Water), Chlorination, Chemical oxygen demand.
Identifiers: Azo dyes.

The Prudhow sewage works, Prudhow, United Kingdom, receives industrial effluent from a plant which manufactures azo dyes. This effluent has in the past given a red coloration to the sewage works' effluent and also to the river in which the effluent was discharged. Pretreatment of the industrial waste water by chlorination was instituted to reduce the intensity of the color of both the raw waste water and the effluent from the sewage works. An investigation has recently been conducted on the effect that the chlorinated azo dye waste water has upon the activated sludge process utilized at the Prudhow works. It was concluded that neither azo dyes nor chlorinated azo dyes have an appreciable effect on activated sludge. Chemical oxygen demand and optical density studies indicate that the effluent passes through an activated sludge plant relatively unchanged. Chlorination appears to be the only practical method for color and COD removal from azo dye wastes. However, more dangers may be present in chlorination than in leaving the color. At least 17 chlorinated organic groups were found in samples of the chlorinated waste water collected over one week. (Orr-FIRL)
W76-07516

A SOLUTION TO A PROBLEM OF FILTER CLOTH BLINDING,
Water Pollution Research Lab., Stevenage (England).
M. J. D. White, and R. C. Baskerville.
Effluent and Water Treatment Journal, Vol. 14, No. 9, p 503-505, September, 1974. 1 fig, 3 tab, 5 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Filtration, Grease, Sludge treatment, Lime.
Identifiers: Filter cloth blinding, Sludge conditioning, Ferric chloride.

The sewage works at St. Ives, Huntingdonshire, United Kingdom, was designed to treat 1500 cu m of sewage per day but now treats 2680 cu m per day of which about 20% is industrial. The BOD of the industrial waste is close to 2000 mg/liter and it seems to contain unusually high quantities of grease. A problem of filter blinding when dewatering the sludge (possibly caused by the high grease content) was so severe that filtering of the sludge was abandoned and the sludge was disposed of by tanker or dried on beds. A laboratory method for assessing filter cloth blinding together with an assessment of filtrability was used by the Water Research Centres' Stevenage Laboratory, Herts, to choose a conditioning system that was suitable for a sludge with such a high grease content. Results of the study indicated that ferric chloride and lime should be used instead of the previously recommended aluminum chlorohydrate. The use of ferric chloride and lime has enabled the treatment works to obtain a net yield of sludge cake of 12 kg/sq m hr at a cake solids content of 19%, which is greater than the design yield of the filter. The frequency of cloth washing has been reduced to once per 300 hours but is still more frequent than average values. (Orr-FIRL)
W76-07517

IMPROVED FORMAZAN TEST FOR THE DETERMINATION OF THE DEHYDROGENASE ACTIVITY OF ACTIVATED SLUDGE IN WASTE WATER TREATMENT PLANTS FOR THE JOINT BIOLOGICAL PURIFICATION OF URBAN AND TANNERY-GENERATED WASTE WATERS (VERFEINERTER FORMAZANTEST DER DEHYDROGENASENAKTIVITAET VON BELEBTSCHLAEMMEN IN ANLAGEN ZUR GEMEINSAMEN BIOLOGISCHEN REININGUNG VON GERBEREIABWAESSERN UND STAEDTISCHEN ABWAESSERN),
J. Gajdusek J. Kupec, and J. Svancer.
Wasserwirtschaft-Wassertechnik, Vol. 24, No. 6, p 193-194, 1974. 5 fig, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Tannery wastes, Activated sludge, Municipal wastes, Analytical techniques, *Pollutant identification.
Identifiers: Dehydrogenase activity, Formazan test, Combined municipal-industrial wastes.

An improved formazan test has been developed for the determination of the dehydrogenase activity of activated sludge in waste water treatment plants. The plants purify combined urban and tannery-generated waste waters. The influence of temperature and pH value on the result of the formazan (TTC) test was studied. The TTC method is based on the enzymatic reduction of the colorless 2,3,5-triphenyl-tetrazolium chloride by reductases to red 2,3,5-triphenylformazan which is subsequently determined quantitatively by a colorimetric method. The rate of reduction of the reductase activity is proportional to that of the biological activity, or to the performance of the activated sludge. Incubation tests conducted at 20 C in a pH range of 6-11 revealed highest 2,3,5-triphenylformazan output at pH values between 9 and 10. Tests performed at pH 7 in a temperature range of 5-30 C revealed a nearly linear increase of 2,3,5-triphenylformazan output with temperature. (Takacs-FIRL)
W76-07518

STATUS AND PERSPECTIVES OF THE IMPROVEMENT OF BIOCHEMICAL WASTE WATER TREATMENT FACILITIES IN PETROLEUM REFINING PLANTS (SOSTOYANIYE I PERSPEKTIVY SOVERSHENSTVOVANIYA SOORUZHENIY BIOKHIMICHESKOY OCHISTKI STOCHNYKH VOD NPZ),
V. Ya. Gerber.
Khimya i Tekhnologiya Topliv i Masel, No. 9, p 10-14, 1974. 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Biological treatment, Aeration, Activated sludge, Reviews, *Treatment facilities, *Oil wastes.
Identifiers: Refinery wastes.

The state-of-the-art and perspectives in the development of biological waste water treatment in petroleum refining plants are presented. Ordinary effluents are treated in one-stage aeration tanks for 6 hrs at an air expenditure of 20-25 cu m per cu m of water and an activated sludge concentration of 2-3 g/liter. The phosphorus and nitrogen levels are adjusted to 3 and 15 mg/liter, respectively. The waste water thus treated is settled in a settler for 3 hrs. The emulsion-containing, saline waste water is first treated with de-emulsifiers. Non-ionogenic, biodegradable emulsifiers have been developed for this purpose. Possibly combined with municipal or chemical waste water, the de-emulsified waste water is then purified in aeration basins; this process can be substantially improved by the use of technical oxygen in place of oxygen in tight tanks, and of sectional, displacement type aeration tanks instead of stirrer type tanks. Final purification can be performed in lagoons. (Takacs-FIRL)
W76-07519

CONTROLLING PHENOLS IN REFINERY WASTE WATERS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
R. W. Short, Jr., B. L. DePrater, and L. H. Myers.
The Oil and Gas Journal, Vol. 72, No. 47, p 119-124, November 25, 1974. 7 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Phenols, Biological treatment, Activated carbon, Analytical techniques, *Oil wastes.
Identifiers: Refinery wastes.

The control of phenols in petroleum refinery waste waters has been of concern for some time. A review is given of cooperative field studies by petroleum refiners, various regulatory agencies, and the American Petroleum Institute. The various studies identified the sources of phenolics in petroleum refining as the catalytic cracking process, the caustic treatment of cracked gasoline, and hydrocracking. Analytical reliability of

refinery waste water data, using EPA methodology, was improved by a seminar on analytical procedures. Both biological and activated carbon treatment systems demonstrated a high capacity for removal of phenolics. However, biological systems were found to be easily upset by changes in phenolics concentration. Activated carbon systems can provide excellent treatment if the pH of the waste streams is controlled; caustic conditions in the activated carbon columns must be prevented. (Orr-FIRL)
W76-07520

BASIC TRENDS IN THE IMPROVEMENT OF WATER SUPPLY, SEWER AND WASTE WATER TREATMENT SYSTEMS AT PETROLEUM PROCESSING PLANTS (OSNOVNYYE NAPRAVLENIYA V SOVERSHENSTVOVANII SISTEM VODOSNABZHENIYA, KANALIZATSII I OCHISTKI STOKOV NPZ),
A. S. Eygenson, and E. G. Ioakimis.
Khimiya i Tekhnologiya Topliv i Masel, No. 9, p 7-10, 1974. 8 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, Recycling, Water reuse, Biological treatment, *Oil wastes, Sewers, Water supply.
Identifiers: Refinery wastes.

Basic trends in waste water treatment in the petroleum processing industry of the USSR are outlined. Efficient biological treatment plants, including oil traps, secondary settling tanks, sand filters, flotators, and one- or two-stage aerators are available at most of the petroleum processing plants. Recycling of the industrial water following biological purification is envisaged. The sulfurous, lye-containing effluents with high phenol and ammonia contents are the most polluted waste waters of petroleum processing plants. Such effluents should be treated by means of regenerable reagents in place of caustic soda, and technologies eliminating or minimizing such effluents should be developed. Methods for the recovery of sulfur and ammonia from such waste waters are being studied. The biological purification, usually conducted at a water flow rate of 0.3-0.5 m/sec, can be intensified by the use of technical-grade oxygen instead of air. (Takacs-FIRL)
W76-07521

ULTRAFILTRATION OFFERS 'GOOD' REMOVAL OF COLOR, COD, BOD,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Chemical Engineering.
M. Fels, D. Smith, C. Miller, and P. Miller.
Canadian Pulp and Paper Industry, Vol. 27, No. 9, p 50-52, September, 1974. 4 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Color, *Chemical oxygen demand, *Biochemical oxygen demand, Membrane processes, Costs.
Identifiers: *Ultrafiltration.

An investigation was conducted of the effects of ultrafiltration on bleached Kraft mill effluent with respect to COD, BOD5, and color reductions. The unit used in this study was a Amicon Ultrafiltration Cell, Model 4015. The liquid is forced through a Diaflo Ultra Membrane under pressure; solvents and low molecular weight components pass through the membrane and are the ultrafiltrate, the molecules of higher molecular weight are rejected by the membrane and remain in the cell as the concentrate. Ultrafiltration is considered to provide good removal of color, COD and BOD loadings. The cost of this process is relatively high. A 500 ton/day plant with an operating cost of $1.00/1000 gallons would require a capital investment of $20-$50 million. The results of the study indicate that maximum effectiveness is gained by using a membrane which has a molecular weight cutoff of 10,000. Since color, COD and BOD removal are not dependent on pressure, the process has the advantage of operating at low pressures as opposed to reverse osmosis which must operate at a very high pressure. The stirring rate was found to be an important parameter for practical applications. Design work on the hydrodynamic aspects of the equipment must be considered together with the membrane characteristics. (Orr-FIRL)
W76-07522

CHEMICAL RECOVERY PROCESS FOR SPENT COOKING LIQUORS,
Hiroshima Inst. of Tech., Itsukaichi (Japan).
M. Ono, and M. Yoneda.
Mitsubishi Heavy Industries Technical Review, Vol. 11, No. 1, p 61-67, February, 1974. 9 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Sulfite liquors, *Pulp wastes, Aeration, Separation techniques, Recycling.
Identifiers: Kraft pulping wastes, *Chemical recovery.

A new chemical recovery process for sulfite spent cooking liquor in the paper and pulp industry is summarized. Sodium carbonate is first separated by evaporating the smelt solution obtained by burning concentrated spent liquor in a recovery boiler. The sodium sulfite is produced in crystalline state by oxidizing the mother liquor of sodium sulfide with air in a sodium hydroxide solution which ranges from 15 to 25% by weight at a temperature over 100C. Thus, in the first step the process crystallizes and separates Na2CO3 from the water solution of smelt and in the next step aerates Na2S filtrate in NaOM solution to turn the Na2S into Na2SO3 crystal. Compared with conventional processes, this is simpler and is also capable of regenerating Na2SO3 of comparatively high purity. This method is applicable to a wide production ratio of pulps for the cross recovery of kraft spent liquor and sulfite spent liquor. (Murphy-FIRL)
W76-07523

STUDIES ON THE REMOVAL OF HEAVY METAL IONS FROM WASTE WATER BY FLOTATION METHOD WITH ANIONIC SURFACTANT I. - REMOVAL OF TRACES OF CADMIUM ION WITH SODIUM DODECYLBENZENE SULPHONATE, (IN JAPANESE),
M. Nakagawa, and Y. Kaida.
Reports of Government Industrial Research Institute (Kyushu), No. 9, p 10-18, 1973. 12 fig, 18 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, Surfactants, *Cadmium, *Floration, *Ions, Trace elements.
Identifiers: Sodium dodecylbenzene sulfonate.

The removal of heavy metal ions from waste water by a flotation method using an anionic surfactant was investigated. Specifically, traces of cadmium ions were removed with sodium dodecylbenzene sulfonate (DBS). The residual concentration of Cd in the flotation (15 to 30 minutes) of Cd nitrate solution (one ppm Cd) was 0.03 to 0.05 ppm at a pH of 4 to 11. The probable chemical species of Cd removed are divalent cations at pH 4 to 9 and precipitates of hydroxide at pH 5 to 11. With the addition of P04(3-), remarkable effects upon the removal were shown in the addition of Ca (50 ppm or more). This probably resulted in the formation of a certain Ca-Cd-hydroxyphosphate. After the effective height of the foam layer in the cell for the flotation was defined, the effect of repeating the flotation two times was examined. The residual concentration after repetition was 0.1 ppm or less in the case of one ppm initial Cd, and 50 ppm Ca, with the addition of P04(3-), being kept equivalent to the initial Cd, and 10 ppm DBS for each flotation. (Murphy-FIRL)
W76-07524

EXTRACTION OF VANADIUM AND CHROMIUM FROM EFFLUENTS.
Netherlands Patent NL 7313-348. Issued April 9, 1974. Derwent Netherlands Patents Report, Vol. V, No. 17, p M1, May 31, 1974.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, Metals, *Chromium, *Separation techniques.
Identifiers: *Vanadium.

A method was patented for the extraction of vanadium and chromium from effluents using aliphatic amines as the extraction agent. This is a two phase process whereby aqueous solutions containing dichromate and polyvanadate ions are treated. In the first phase, dichromate ions are selectively extracted at pH 1-3 with aliphatic amines. The chromium is recovered by extracting the organic phase with alkali hydroxide solution. In the second stage, the remaining polyvanadate ions are extracted from the aqueous solution at pH 3.5-5 using a similar extracting agent. The organic phase is again extracted with an alkali hydroxide solution. One suitable extracting agent is tri-n-octyl/tri-n-decylamine, mixed with a high boiling aromatic hydrocarbon. (Murphy-FIRL)
W76-07525

METHOD FOR INSOLUBILIZING WATER SOLUBLE CHROMATE IN CHROME WASTE RESIDUE,
Nippon Denko Co. Ltd., Tokyo (Japan). (Assignee).
S. Adachi.
United States Patent 3,803,032. Issued April 9, 1974. Official Gazette of the United States Patent Office, Vol. 921, No. 2, p 702-703, April, 1974. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Patents, Lignite, Pulp wastes, Activated carbon.
Identifiers: Chromate insolubilizing, *Chrome wastes.

A patent was granted for a method of insolubilizing water soluble chromate in chrome water residue. This water-leached residue occurs from roasted products which are obtained by the alkali oxidizing roasting of chrome ore. The chromate may be insolubilized and fixed into the residue by mixing the lumpy and/or powdery water-leached residue with organic materials. These organics are capable of being converted into activated carbon, by roasting the mixture in a gaseous atmosphere with a low oxygen concentration. A gas temperature of 400 to 1000 C and a material temperature of 400 to 700 C is used to quench the roasted product. The organic materials used include pulp waste liquor, lignite, sawdusts, pulp sludge, and chaffs. (Murphy-FIRL)
W76-07526

POLYMERS SOLVE WASTE WATER PROBLEMS,
Betz Labs. Inc., Trevose, Pa.
W. R. Cook, and L. V. Rankin.
Iron and Steel Engineer, Vol. 51, No. 5, p 43-46, May, 1974. 5 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Steel, Metals, *Polymers, *Polyelectrolytes, Flocculation, Coagulation.
Identifiers: Iron and steel industry.

The iron and steel industry uses millions of gallons of water and accumulates many tons of contaminants including metallic particles, dirt, oil, grease, carbon, and acid. The use of polymers (polyelectrolytes) has been applied to alleviate waste water problems. However, the uses and effects of such polyelectrolytes in flocculation and coagulation are still uncertain. Variables such as type of charge, density of charge, and molecular weight influence a particular polymer's effective-

ness. On-site testing proved to be the best method for choosing a polymer for a particular system. In the iron and steel industry, polymers are used for influent clarification, gas scrubber systems, hot mill systems, cold mill operations, and sludge handling. (Murphy-FIRL)
W76-07527

INCINERATION GIVES NEAT ANSWER TO PHARMACEUTICAL WASTES DISPOSAL PROBLEMS.
For primary bibliographic entry see Field 5E.
W76-07529

ABSORPTION CLEANING OF ORGANIC EFFLUENT VAPOURS,
Y. G. Sukharev, Z. A. Simanenko, and V. A. Stepanov.
Soviet Patent SU 391842. Issued December 13, 1973. Soviet Inventions Illustrated, Vol. V, No. 18, p J5, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Absorption, Chemical wastes, Air pollution, Organic compounds, *Patents, Odor.
Identifiers: Effluent vapors, Polyorganosiloxane liquids.

A patent was issued for the use of a lower polyorganosiloxane liquid as an absorbent in the cleaning of organic effluent vapors. Such solvent vapors as aromatic and aliphatic hydrocarbons were shown to be most effectively absorbed and regenerated by the use of polyethylsiloxane liquids, such as No. 3 (GOST 13004-67), as the absorbent. Absorption equipment may be conventional; the vapors are absorbed at 20 to 40 C. As an example, an air-vapor mixture containing 5 mg/liter turpentine was purified using polyethylsiloxane liquid No. 3, with an adsorption volume for turpentine of 19%. (Murphy-FIRL)
W76-07530

EFFLUENT TREATMENT IN THE LEAD CRYSTAL INDUSTRY,
J. B. Cappi.
Glass, Vol. 51, No. 4, p 143-145, April, 1974. 1 fig, 2 tab, 2 photo.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Lead, Suspended solids, Neutralization, Chemical precipitation, Coagulation, Fluorides, Sulfates.
Identifiers: Lead crystal manufacturing wastes, Lead oxide.

A control system for effluents produced from lead crystal manufacture was established by the Serck Eftrol company. These toxic discharges contain up to 35% lead oxide which originates from cutting, polishing and fume scrubbing. Contaminants which must be processed are suspended solids, fluorides, sulphates, and lead. The basis of the described treatment scheme was neutralization of the combined discharge which also serves to precipitate fluorides, sulphates, and lead, and to coagulate the colloidal suspended solids. One glass manufacturing plant in the Stourbridge area of Worcestershire was analyzed, with results of discharge limits for the effluent in terms of fluorides and sulphates. Operating data on the plant included flow rates, reagent consumptions, sludge production, and manpower requirements. (Murphy-FIRL)
W76-07531

ON THE APPLICABILITY OF THE BOD PARAMETER TO THE CHARACTERIZATION OF COKING PLANT-GENERATED EFFLUENTS (K VOPROSU O PRIYEMLEMOSTI POKAZATELVA BPK DLYA KHARAKTERISTIKI STOCHNYKH VOD KOKSOKHIMICHESKIKH ZAVODOV),
L. I. Khlopkova, G. I. Papkov, Ye. D. Schastlivenko, and V. A. Mgen.
Koks i Khimiya, No. 3, p 29-31, 1974. 3 tab, 12 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Biochemical oxygen demand, Biodegradation, Phenols, Temperature, Aeration.
Identifiers: Coking plant effluents, Rhodanides.

A study has been carried out to determine the relevancy of the BOD parameter for the characterization of coking plant-generated effluents. The BOD determination had poor reproducibility due to the high concentration of ammonia and ammonia salts in the phenol-containing waste waters. The BOD parameter was found unsuitable for the characterization of the degree of pollution of phenol-containing coking plant effluents and for the design of biochemical treatment plants due to the presence in them of various components, such as phenol and rhodanides with greatly differing rates of biochemical degradation. The rates of biodegradation of phenol and rhodanide, measured at 32 C, were found to be 100 mg/liter and 30-35 mg/liter, respectively. Both rates increased with increasing temperature. The volume and the operation of the aeration tanks for the biochemical treatment of coking plant-generated effluents should be determined with respect to the rhodanides as the least oxidizable pollutants. (Takacs-FIRL)
W76-07532

TREATMENT AND DISPOSAL OF WASTEWATER FROM ONION DEHYDRATION FACTORY AT SATPUR, NASIK,
Maharashtra Engineering Research Institute, Nasik (India).
G. B. Ambawane, N. Y. Dhekane, P. V. Patki, and B. R. Kapre.
Journal of the Institution of Engineers (India), Vol. 54, Part PH1, p 10-13, October, 1973. 1 fig, 3 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Odor, Sedimentation, Coagulation, Aeration, Oxidation lagoons, Dehydration, Waste water disposal.
Identifiers: Extended aeration, *Onion dehydration wastes, Oxidation ditches.

An onion dehydration plant in India with a capacity of 30 to 33 tons per day produced about 272,400 liters of waste water per day, which, besides having substantially high loads of pollution, was also characterized by a pungent odor. Possible treatment methods tried included sedimentation, spray disposal, use of coagulents such as aluminum sulphate, ferric chloride, and ferrous sulphate (alone and in conjunction with lime), and extended aeration in an oxidation ditch. Of the methods tested, extended aeration in an oxidation ditch appeared to be the most practical. Advantages of this method included: simplicity and low initial investment in equipment; low production of sludge; low maintenance costs; BOD reduction of 95%; pungent odor removal; and excellent settling characteristics. (Murphy-FIRL)
W76-07533

ANALYSIS OF SOME PHYSICAL PROPERTIES OF POULTRY PROCESSING CHILLER EFFLUENT,
Richard B. Russell Agricultural Research Center. Athens, Ga.
W. K. Whitehead.
Poultry Science, Vol. 53, No. 2, p 571-574, March, 1974. 1 fig, 1 tab, 2 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Costs, Water reuse, Biochemical oxygen demand, Dissolved solids, Suspended solids, Screening, Treatment facilities, Poultry, *Recycling.
Identifiers: *Poultry processing wastes.

Poultry processing plant chiller effluent is normally discharged to the sewer with no reuse of the water. By recycling the chiller water, a processing plant with capacity of 9600 birds per hour could save 10,000 dollars per year in water and refrigeration costs. Five such plants were sampled and physical properties of the waste water were measured to determine BOD, fat, and total and suspended solids content. Over 60% of the total solids in the waste water were dissolved solids, which could not be removed by screening and filtering. However, 51% of the suspended solids and 77% of the settleable solids could be removed by a 325 mesh sieve. (Murphy-FIRL)
W76-07534

TREATMENT OF DAIRY EFFLUENT WATERS TREATMENT.
French Patent FR 2187-704. Issued February 22, 1974. Derwent French Patents Abstracts, Vol. V, No. 11, p D6, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, *Patents, Dairy industry, Fermentation, Aerobic conditions, Bacteria, Suspended solids, Separation techniques.
Identifiers: *Dairy effluents.

A method of dairy waste water effluent purification is described. The effluent waters are purified by fermenting the material at 20-37 C with an aerobic and non-pathogenic bacteria strain containing l beta-galactosidase or a lactose oxidase, followed by separation of the bacterial material. Whey from cheese manufacture is generally fermented with a bacterial strain of the Enterobacter or Serratia species at 25-30 C and pH 6-7 for about 48 hours after which the medium is centrifuged to separate the bacterial solids. Ten percent of the culture is retained for the next batch and the remainder of the protein-rich bacterial mass can be used as animal feed. The treated effluent has a much lower content of solids and of reducing sugars such as lactose. (Murphy-FIRL)
W76-07535

CANDY WASTE TREATMENT,
W. D. Hatfield.
Industrial Wastes, Vol. 22, No. 2, p 20-22, 32, March/April, 1974. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Activated sludge, Lime, Costs, Capital costs, Biochemical oxygen demand, Hydrogen ion concentration, Nitrogen, Phosphorus, Nutrient requirements, Illinois.
Identifiers: *Candy manufacturing wastes, Carbohydrate wastes.

The Lucy Ellen Candies' plant in Sullivan, Illinois, was producing 12,000 gallons/day of industrial and domestic sewage with a BOD of 420 lbs. In order to achieve a 90% BOD reduction, or about 50 lbs/day, three alternative treatment methods were considered. These were: complete mix activated sludge with mechanical aeration, activated sludge diffused air in a pre-fabricated package unit, and trickling filter (surf plastic media) with recirculation. Of these, the first plan was selected. After initial start-up time and sludge build-up, effluent BOD was reduced to 50-150 mg/liter which was more than sufficient to meet the required standard of 500 mg/liter. It was necessary to add lime softener sludge from a local water works plant to weight down the activated sludge and to control pH at the desired value of 7-7.2. Ammonia nitrogen and phosphorus nutrients were also required because the carbohydrate waste from the candy operation lacked these essential chemicals. Costs of the system were given as $35,600 capital investment plus power costs for operation of $3.70/day. No operating or maintenance costs were provided. (Murphy-FIRL)
W76-07536

LIQUID WASTE TREATMENT FOR THE PETROLEUM REFINING INDUSTRY (SEIKIYU SEISEI NI OKERU HAISUI SHORI),
K. Fujimori, and F. Sato.
Nenryo oyobi Nensho, (Fuel and Combustion) Vol. 41, No. 7, p 635-640, July, 1974. 3 fig.

Descriptors: *Industrial wastes, *Waste water treatment, *Activated sludge, *Oil wastes, Separation techniques, Incineration, Sludge treatment, Sedimentation, Liquid wastes.
Identifiers: *Petroleum wastes.

The Mizushima Refinery of the Japan Mining Company installed an API oil separator and a coagulation settling tank (clarifier) at the time of its initial operation in 1961. More recently, an activated sludge treatment system together with a dehydration system and sludge incineration system was constructed, based on the new water quality standards and water protection laws. Waste water in a refinery is one of three types: rainwater, sea water for cooling, or oil containing liquid waste. The third is comprised of liquid wastes from the refining system, scrubber, pump seal water, tank drains, and rainwater containing oil, and requires special treatment. These liquid wastes contain emulsified oil, preservatives, chemicals of various kinds, sulfides, and impure substances in crude oil. The mixture of these is first treated in the API oil separator. After adjusting pH, the liquid is fed into the activated sludge treatment system. Part of the liquid is fed into the clarifier. Part of the treatment water is used in the aeration tank, settling tank spray water, and the incineration system dust collector. The emulsion from the API oil separator is sent to a centrifugal separator; oil is recovered and sludge is sent to the incinerator. (Seigle-FIRL)
W76-07537

EXPERIENCE WITH THE PURIFICATION OF WASTE WATER IN RESERVOIRS (OPYT OCHISTKI STOCHNYKH VOD V REZERVUARAKH),
V. M. Zikunov, and A. Sh. Akzigitov.
Neftepromyslovoye Delo, Vol. 1, p 38-40, March, 1974. 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil wastes, Sedimentation, Equipment, Oxygen, *Dewatering, Separation techniques, *Settling basins.
Identifiers: *Petroleum wastes, Stratal water, Crude oil.

Experiences with the purification of stratal water and other effluents containing petroleum products, as generated during the dewatering and processing of crude oil, are presented. The stratal water separated from crude oil is admitted to vertical settling tanks without contacting oxygen. The stratal water is admitted to the petroleum layer floating on the surface by means of jet baffles. The floating petroleum layer is drained for recirculation in the dewatering process, and the purified water, after emulsion separation, is drained at the bottom and discharged in wells. Waste waters and relatively pure effluents containing oxygen decrease the efficiency of the settling tanks; they should be treated separately. (Takacs-FIRL)
W76-07538

SOLUTION TO THE WASTEWATER PROBLEM IN THE SHEET-METAL PROCESSING INDUSTRY (LOESUNG VON ABWASSERPROBLEMEN DER BLECHVERARBEITER),
K. Marquardt.
Baender Bleche Rohre, Vol. 15, No. 4, p 161-164, 1974.

Descriptors: *Ion exchange, *Reverse osmosis, *Metals, *Waste water treatment, *Industrial wastes, Water reuse, Recycling, Effluents.
Identifiers: *Ultrafiltration, Electroplating, Sheet-metal processing.

The function and uses of ion exchangers, reverse osmosis, and ultrafiltration in the purification of waste waters generated in the sheet-metal processing industry in general, and in electroplating shops in particular, are described. Ion exchangers with regeneration in counterflow permit considerable reduction in reagent and water expenditure. Strong basic anion exchangers should have a pre-stage in the form of a weak basic anion exchanger for the removal of organic compounds and heavy metal-cyanide complexes from the strong basic ion exchange resin in counterflow. It isj possible to automate ion exchangers for continuous or semi-continuous operation and reduced reagent consumption. Reverse osmosis, possibly combined with ultrafiltration and the ion exchange process, is suitable for: the recovery of precious metals and reagents; the preparation of drinking water and high-purity water; and the detoxification of toxic effluents such as those generated in the electroplating industry. (Takacs-FIRL)
W76-07539

CHROMIUM REMOVAL FROM WASTEWATER BY ELECTROCOAGULATION (ELEKTROKOAGULYATSIONNAYA OCHISTKA STOCHNYKH VOD OT KHROMA),
G. A. Selitskiy, and N. P. Antropov.
Tsvetnyye Metally, No. 4, p 85-86, 1974. 1 fig, 1 tab.

Descriptors: *Chromium, *Waste water treatment, *Electrolysis, Industrial wastes, Anodes, Cathodes, Coagulation.
Identifiers: Electroplating, *Electrocoagulation, Steel electrodes.

A simple, highly effective method removes hexavalent chromium from industrial waste waters as generated in electroplating processes by electrocoagulation. The waste water containing chromates is subjected to electrolysis between steel electrodes, whereby bivalent iron and hydrogen are released by the anode and cathode, respectively. The bivalent and trivalent iron ions and the trivalent chromium ions reduced from hexavalent chromium form hydroxides that can be quantitatively separated. Electrolysis is conducted with direct current, using a current density of 0.8-1.2 A/sq dm for chromate concentrations up to 120 mg/liter. Electrolysis takes 15 to 20 minutes. It was found possible to quantitatively remove chromium from waste waters by this electrocoagulation process. (Takacs-FIRL)
W76-07540

THE OPERATION OF THE FLOTATING HYDROCYCLONE IN THE CLARIFICATION OF ROLLING MILL-GENERATED WASTEWATERS (RABOTA GIDROTSIKLONA-FLOTATORA DLYA OSVETLENIYA STOCHNYKH VOD PROKATNYKH TSEKHOV),
L. D. Subbotkin.
Tsvetnyye Metally, No. 4, p 86-87, 1974. 1 fig.

Descriptors: *Waste water treatment, *Copper, *Zinc, *Suspended solids, *Oil wastes, *Industrial wastes, Metals.
Identifiers: Rolling mill wastes.

The use of flotating hydrocyclones for the clarification of rolling mill-generated waste waters containing 0.4-0.5 mg copper, 0.6-0.7 mg zinc 10-50 mg suspended matter, and 50-200 mg petroleum products per liter is discussed. The pressure under which the waste water is to be saturated with air (calculated as a function of the water and air expenditures, air density, the solubility of nitrogen in water, the duration of the saturation, and the rate constant of the solution of air in water) was found to be 3.5 atm. Experiments with flotating hydrocyclones of one to two m in diameter under practical conditions revealed efficiencies of 50-60% for suspended matter, and 60-70% for petroleum products. The residual suspended matter and petroleum product contents in the clarified water were in the respective ranges of 10-25 mg/liter and 30-50 mg/liter. (Takacs-FIRL)
W76-07541

WASTE WATER TREATMENT BY MEANS OF ION EXCHANGE RESINS (TRATTAMENTO DI ACQUE DI SCARICO CON RESINE A SCAMBIO INOICO),
La Nouva Chimica, No. 3, p 71-75, March, 1974.

Descriptors: *Ion exchange, *Waste water treatment, *Recycling, Water reuse, Industrial wastes, Metals, Copper, Nickel, Zinc, Cadmium, Sodium, Cyanides, Activated Carbon, Resins.
Identifiers: *Electroplating, Ion exchange resins, Cationic ion exchange resins.

The technological and economic advantages of the use of ion exchange resins for waste water treatment, especially in the electroplating and surface-treatment industries, are described. The water treated by ion exchange resins is of constant quality regardless of fluctuations in ion concentration. Ion exchange resins are also suitable for the recycling of process water after the removal of ions, and for the recovery of precious metals from liquids. Lewatit ion exchange resins are used for the removal of chromates, cyanides, and other toxic substances including nonionogenic substances, from process waters. The waste water to be treated by ion exchange resins should be purified by filters or activated carbon. Cationic ion exchange resins are regenerated by means of hydrochloric or sulfuric acid, and caustic soda is used for the regeneration of anionic resins. It is possible to economically remove copper, nickel, zinc, cadmium, sodium, chromic acid, cyanides, phosphoric acid, and nitric acid from process waters provided their individual concentrations are below 500 mg/liter. (Takacs-FIRL)
W76-07542

APPLICATION OF SIMILITUDE AND MODELING IN WASTE WATER TECHNOLOGY (ANWENDUNG DER AEHNLICHKEIT UND MODELLIERUNG IN DER ABWASSERTECHNOLOGIE),
I. Horvath.
Gas and Wasserfach, Wasser/Abwasser, Vol. 115, No. 3, p 128-136, March, 1974. 8 fig, 30 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Model studies, Kinetics, Equipment, Chemical industry, Operation, Design.

Problems and possibilities of the application of the similarity theory in modeling waste water treatment facilities with respect to scale-up are discussed. In the study of waste water treatment, technology and equipment, geometric, kinetic, and dynamic resemblances, as well as similarities in material transfer, reaction kinetic, and biological processes are of primary interest. While it is impossible to achieve absolute similarity, satisfactory results can be obtained by approximate modeling. Results achieved in the areas of zymology, chemical industry, and hydrology will be valuable in the study of modeling and scale-up with respect to waste water treatment plants. (Takacs-FIRL)
W76-07543

EXTRACTIVE-POLAROGRAPHIC DETERMINATION OF STYRENE AND METHYLMETACRYLATE IN INDUSTRIAL WASTE WATERS (EKSTRAKTSIONNO-POLYAROGRAFICHESKOYE OPREDELENIYE STIROLA I METILMETAKRILATA V PROMYSHLENNYKH STOCHNYKH VODAKH),
For primary bibliographic entry see Field 5A.
W76-07544

POSSIBILITIES OF AUTOMATING THE OPERATION OF CLARIFYING THICKENERS IN PROCESSING PLANTS BY USING OR-

GANIC-SYNTHETIC FLOCCULANTS (MOYENS D'AUTOMATISER PAR L'EMPLOI DE FLOCULANTS ORGANIQUES SYNTHETIQUES LE FONCTIONNEMENT DES EPASSISSEURS CLARIFICATEURS UTILISES DANS LES INSTALLATIONS DE PREPARATION),
J. Reuter.
Aufbereitungs-technik, Vol. 15, No. 4, p 187-193, 1974. 8 fig, 7 ref.

Descriptors: *Sludge treatment, *Waste water treatment, Flocculation, Pulp and paper industry, *Pulp wastes, *Industrial wastes, Polymers, Flow rate, *Automation.
Identifiers: *Sludge thickening, Polyacrylamide.

The operation of a clarifying thickener, used in technological processes for continuous solid-liquid separation of pulps, can be automated by using synthetic flocculants, such as polyacrylamide, as long as the requirement is maintained for keeping the overflow water always free of settleable matter. The organic flocculant is added immediately before admission of the pulp to the thickener at a rate not higher than 0.1 percent. The volume and the solids content of the pulp feed are measured (the volume by a magnetic-inductive method and the solids content by radiometry) continuously, and the product of the two measured values will give the quantity of the solid matter being fed to the thickener. The flocculant metering is regulated automatically as a function of the solids volume. For maintaining a uniform degree of sludge thickening, the level in the thickener is monitored permanently by means of dip pipes or a depth-finder, or radiometrically by isotope barriers. The sludge quantity to be withdrawn is regulated as a function of the flow rate of the sludge pump in such a way that the level in the thickener remains almost identical. (Takacs-FIRL)
W76-07545

PLASMA TREATMENT OF TEXTILES: A NOVEL APPROACH TO THE ENVIRONMENTAL PROBLEMS OF DESIZING.
Textile Chemist and Colorist, Vol. 5, No. 11, p 27-36, November, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Pollution abatement, Oxidation, Degradation(Decomposition).
Identifiers: Desizing, *Plasma treatment, Polyvinyl alcohol, Oxidative degradation, Fiber degradation.

The textile sizes applied to warp yarns to facilitate weaving which must be removed from the fabric before finishing greatly contribute to the pollution problems of the textile finishing industry. One of the most widely used of the synthetic sizing agents, polyvinyl alcohol (PVA), is not easily biodegraded. For this reason, a study of the use of low temperature plasma, an electrically excited form of gases at low pressure, for the removal of PVA size from fabrics was performed. Results indicate that PVA is oxidatively degraded by both oxygen and air plasmas. A significant portion of the PVA is oxidized directly to carbon dioxide and water during plasma exposure, which will reduce problems associated with the desizing operation. Fiber degradation due to this treatment is minimal and no adverse effects on fabric properties were observed. (Sandoski-FIRL)
W76-07623

CLOSED SYSTEM AND THE MODERN TECHNOLOGY (KUROZUDO SHISUTEMU TO GENDAI GIJUTSU),
Agency of Industrial Science and Technology, Tokyo (Japan).
T. Sakai.
Gijutsu to Kogai, (Technology and Pollution), Vol. 4, No. 1, p 14-17, January, 1975. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Recycling, Chemical wastes, Coagulation, Oil industry, Liquid wastes.
Identifiers: Zero discharge, Closed systems, Tin, Antimony.

A closed system for liquid waste treatment is being used in an electric appliance factory for its welding-plating process which uses antimony and tin. In the system, alkali is added to the plating liquid waste. Metals are coagulated and settled by sodium hydroxide. The supernatant liquid is recirculated back to the scrubber. The settled sludge is dehydrated and dissolved by hydrochloric acid. Water from the dehydration process is sent back to the supernatant liquid tank. Dissolved metals are made into salt, heated, and metal fumes are produced for the welding process. Exhaust is scrubbed, and the clean air is released while the liquid goes to the scrubber. This process recovers about half of the metal originally used in the plating process. Another example of a closed system is found at a chlorinated organic compound manufacturing plant, where liquid waste contains 4% salt and 0.15% toxic organic compounds in the amount of 1500 cu m/day. The treatment of this liquid was considered impossible until a closed system was developed. The liquid waste created by chlorination and caustization of petroleum compounds is heated and evaporated. Condensate is returned to the plant and used in the caustization process. The liquid waste is then centrifugally separated, heated, and evaporated. The distillate is sent to a process which produces glycerine. The separate solid becomes impure salt, which is heated and refined. The heat is recovered and used to form chlorine-caustic soda fume. Heated and refined salt is electrolyzed and chlorinated caustic soda fume is produced, which is used for chlorination and caustization of petroleum components. (Seigle-FIRL)
W76-07624

WASTELESS LIQUID TREATMENT SYSTEM FOR SURFACE COATING PLANTS (HYOMEN SHORI SHISETSU NI OKERU MUHAISUI SHORI SHISUTEMU NI TSUITE),
Y. Ikeda, T. Kokubo, and H. Oshima.
Sangyo Kogai, (Industrial Pollution), Vol. 9, No. 12, p 1205-1212, December, 1973. 11 fig, 5 tab, 8 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Ion exchange, Separation techniques, Water reuse, Recycling, Liquid wastes.
Identifiers: Chemical treatment, Surface finishing wastes, Zero discharge, Closed systems.

Surface coating processes include acid and alkaline deoiling treatment, cleansing, and neutralization; plating by zinc, tin, lead, nickel, chromium, copper, silver, and gold, singly or in combination; and, chromating. A treatment system developed for use with liquid wastes generated from these processes has been designed so that no effluents will be created, and all liquids will be circulated within a closed system. A flow chart describes the process as follows: all liquid wastes enter the scrub water tank and are then sent to the ion exchange resin treatment where liquids are classified into groups and treated separately; deionized liquid circulates back to the scrub water tank; recovered waste, newly created waste from the surface coating process, and other miscellaneous liquid waste are sent together to the chemical treatment system where liquids and solids are separated; and the separated liquid is concentrated and evaporated. Condensed water is circulated back to the scrub water tank and the solid mixes with the solid sludge from the separation process. Metals in the sludge are recovered by contracted metal refiners and reused. Problems in the system are material corrosion, noise, and its appearance. (Seigle-FIRL)
W76-07625

LIQUID WASTE TREATMENT FOR HEAVY METALS (JUKINZOKU NO HAISUI SHORI NI TSUITE),
E. Tatsuta.
Nenryo oyobi Nensho, (Fuel and Combustion), Vol. 41, No. 1, p 39-44, January, 1974. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, Equipment, *Heavy metals, Chemical precipitation, Chemical reactions, Liquid wastes.
Identifiers: Mitsubishi Gockel treatment system, Dyer clarifier.

After a general discussion of the principles of various treatment methods for metals containing effluents, the dyer clarifier and the Mitsubishi Gockel system are described. The dyer clarifier is a vertical structure with a rapid jet stream stirrer at the bottom, a reversed funnel shaped flocculation chamber, a funnel shaped blanket zone, a demister, and a clear water tank at the top. The sludge overflows the funnels of the blanket zone and the flocculation chamber into a sludge condensation chamber, and is discharged. The Mitsubishi Gockel system is a compact, movable system for the chemical treatment of complex industrial waste water containing various types of heavy metals in which condensation, precipitation (settling), and filtering are involved. Many unique chemical reagents are added in the process according to the type of waste liquid. The system, used basically for batch treatments of a small quantity of a highly concentrated, complex chemical waste, is a compact, high performance system that can be installed in a small space. By changing the reagent combinations, various types of liquid waste can be treated. (Seigle-FIRL)
W76-07626

MERCURY RECOVERY,
Belgian Patent 780222. Issued September 4, 1972. Derwent Belgian Patents Abstracts, Vol. U, No. 45, p D1, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Mercury, *Patents, Flash distillation.

A patent has been granted for a method of mercury recovery from aqueous solutions by treating the effluents with a reducing agent and steam distilling finely divided or colloidal mercury. Finely divided or colloidal mercury is removed either by passing live steam into the solution, or by means of steam heated tubes, or by single or multistage flash distillation. The process is especially useful for removing trace quantities of mercury from exhausted brine solutions from electrolysis cells with mercury cathodes. (Sandoski-FIRL)
W76-07627

REVERSE-OSMOSIS SYSTEM FACILITATES DISPOSAL OF USED CUTTING OILS.
Engineers' Digest, Vol. 34, No. 10, October, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Waste water disposal, Legislation, Waste disposal, Fuels, Incineration, Costs, *Oil wastes, *Reverse osmosis.
Identifiers: Cutting oils.

Since the cutting oils employed in machining operations are generally diluted with water in a ratio of about 20:1, problems arise not only in connection with the tanking and hauling of large volumes of liquid, but also with environmental legislation regarding the disposal of cutting fluids. A new disposal system, utilizing a reverse osmosis module with a tubular configuration, has been designed to remove about 95% of the water in the oil and most of the additives. The concentrated oil can then be burnt in heating or process furnaces. The calorific value of the concentrated cutting oil, from 5,000 to 10,000 BTU/lb, provides a fuel bonus. In addition, the water and additives extracted can be used to make up new batches of

cutting fluid, resulting in further cost savings. (Sandoski-FIRL)
W76-07628

WASTE-WATER BIOCHEMICAL PURIFICATION,
L. P. Aleksandrova, N. Ya. Zhdanova, and A. A. Bondarev.
Soviet Patent SU 372181. Issued May 4, 1973. Soviet Inventions Illustrated, Vol. U, No. 45, p D4, December, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Biological treatment, *Patents, *Biochemical oxygen demand, Fungi, Filtration, *Oxidation.
Identifiers: *Microfiltration, Activated sediment.

A method has been patented for the biochemical purification of waste water through oxidation by fungus cultures and microfiltration before treatment with activated sediment. The method may be applied to industrial waste water with biochemical oxygen demand up to 4 g/liter and pH 5-6 by using Fusarium solani var. argillaceum, Fusarium solani var. species, and Fusarium oxysporum. Waste water at pH 5.5 with a BOD of 4000 mg/liter was aerated 24 hours to reduce the BOD to 1000 mg/liter (75% purification). After filtration, the water was aerated for 16 hours to produce 98-99% purification. In the first stage, 0.05-0.3 g/liter fungus was used. In the second stage 3 g/liter activated sediment was added. (Sandoski-FIRL)
W76-07631

DISCONTINUOUS REMOVAL OF SOLVENT FROM POLYMER SOLUTIONS.
West German Patent DT 2050887. Issued October 25, 1973. Derwent German Patents Abstracts, Vol. U, No. 46, p A4, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Polymers, Water reuse, *Patents, Steam, Solvents.

A patent has been issued for the discontinuous removal of solvent from resinous polymer solutions in a single step. The hydrocarbon solution is mixed with water under vigorous stirring and the water is made to boil by injection of live steam. The temperature of the suspension is maintained between 70 C and the boiling point of water. The polymer solution is broken when the water-polymer ratio is maintained at 20:1-6:1. After more steam is added, the suspension is filtered, and the water (containing polymer in a ratio of less than one part polymer to 100 parts water) is recycled. (Sandoski-FIRL)
W76-07632

THE TREATMENT OF SPENT PICKLE LIQUORS CONTAINING MIXED METAL CHLORIDES.
Australian Patent 441,025. Issued October 18, 1973. Official Journal of Patents, Trade Marks and Designs, Vol. 43, No. 39, p 4195, October, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Patents, *Chlorides, Continuous flow, Hydrolysis.
Identifiers: *Waste pickling liquors, Counter-current flow, *Metal chlorides.

A method of treating spent pickle liquors containing from 20-160 grams/liter ferrous ions, from 1-150 grams/liter zinc, and from 5-70 grams/liter hydrogen chloride has been patented. The spent pickle liquors are contacted in a continuous counter-current manner with an anion exchange medium to remove zinc chloride. The quantitative flow rates of the anion exchange medium are adjusted so that all of the zinc will be absorbed. Chloride values are recovered from the resultant chloride solution by high temperature hydrolysis. (Sandoski-FIRL)
W76-07633

GENERAL CONSIDERATIONS ON THE CONDITIONS OF THE ADMISSION OF INDUSTRIAL EFFLUENTS INTO WASTE WATER TREATMENT PLANTS FOR TREATMENT TOGETHER WITH URBAN WASTE WATERS, AND ON THE CONTRIBUTIONS BY THE INDUSTRIES TOWARD THE TREATMENT COSTS (VUE GENERALE SUR LES CONDITIONS D'ADMISSION DES EFFLUENTS INDUSTRIELS DANS LES STATIONS D'EQUATION, POUR TRAITEMENT EN MELANGE AVEC LES EAUX USEES URABAINES, ET SUR LA PARTICIPATION INDUSTRIELLE AU COUT DE CE TRAITEMENT),
D. E. Bond.
Centre Belge d'Etude et de Documentation des Eaux, Vol. 26, No. 359, p 371-377, October, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, Treatment facilities, Sewerage, Cost allocation, Water reuse, Costs.
Identifiers: Great Britain.

General conditions for the discharge of industrial waste water into municipal waste water treatment plants for treatment together with urban waste water, as well as the policy of required contribution by industries toward the treatment costs are surveyed with respect to the situation in Great Britain. According to a law enacted in 1961, local authorities have the right to specify the temperature and pH ranges of industrial waste water channeled into municipal sewer systems, and to measure its volume. Various formulae proposed for the calculation of the fees to be paid by industries for the conveyance, treatment, and disposal of their waste water include such parameters as waste water volume, BOD5 and COD levels, suspended matter content, the costs of sludge disposal, and investment costs for the waste water treatment plant. For practical reasons, however, fees are calculated on the basis of the COD levels. On the other hand, industries can be effectively encouraged to reduce their water consumption and to recycle their waste water by setting an adequate price on industrial water. (Takacs-FIRL)
W76-07634

EFFLUENT TREATMENT,
West German Patent DT 1560331. Issued October 25, 1973. Derwent German Patents Abstracts, Vol. U, No. 46, p F2-F3, October, 1973.

Descriptors: *Pulp wastes, *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Patents, Flocculation, Lime, Hydrogen ion concentration.

An effluent treatment process for use with material from paper manufacturing has been patented. In the clarification of waste water from paper manufacturing, especiaaly from graphic paper process, the conventional method involves adding lime and a flocculating agent such as aluminum sulfate. In this process, the effluent is treated with lime in a first stage under turbulent conditions to produce a pH greater than or equal to 9.0. The treated effluent is then passed to a second stage where the flocculant is added, lowering the pH to 6.8-8.5. (Sandoski-FIRL)
W76-07635

SEPARATION AND EFFLUENT TREATMENT BY ULTRASONICS,
Filtration and Separation, Vol. 10, No. 6, p 740, November/December, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Separation techniques, *Ultrasonics, Food processing industry, Screens, Pulp and paper industry, *Pulp wastes.

The first commercial unit of a novel ultrasonically-assisted separation system has now been installed to process the effluent in a sand washing plant. The system consists of a transducer array positioned underneath a sloping screen. The waste water to be treated is sprayed down the screen through a thin narrow orifice located at the top of the screen. Liquids pass through the screen, while solids travel down to be collected at its base. Experimentally approved application areas include the paper, sand, coal, and food industries. (Sandoski-FIRL)
W76-07636

RECOVERY OF KRAFT WHITE LIQUOR,
D. L. Caldwell.
Canadian Patent 937,707. Issued December 4, 1973. The Patent Office Record, Vol. 101, No. 38, p 20, December, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, *Patents, Alkalinity, Recycling.
Identifiers: *Kraft white liquor recovery.

A patent for the recovery of Kraft white liquor has been issued. While the green liquor is causticized, calcium sulfate is added. This produces a white liquor with a higher than normal active alkali content. Sodium hydroxide may also be added to the liquor to balance added sulfur content introduced by the CaSO4. This method eliminates the need for conventional Na2SO4 addition to the black liquor. (Sandoski-FIRL)
W76-07637

CHLORINE DIOXIDE PULP BLEACHING SYSTEM,
R. Marchfelder.
Canadian Patent 937,705. Issued December 4, 1973. The Patent Office Record, Vol. 101, No. 38, p 19, December, 1973.

Descriptors: *Pulp wastes, *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Patents, Waste disposal, Pollution abatement, Chlorine dioxide, Water reuse, Recycling.

A patent has been granted for a chlorine dioxide bleaching process that improves the efficiency of bleaching paper, reduces the consumption of chemicals, water, and heat, and minimizes waste disposal problems. The process includes a two-stage system for generating chlorine dioxide. Partially spent chemicals discharged from the primary generation stage are more completely reacted under controlled conditions in a dechlorination stage. The chlorine dioxide solution from the dechlorinator is contaminated, and it must be separately collected for use in the early pulp chlorination stages. The purer chlorine dioxide from the primary generator is reserved for use in the latter stages of pulp bleaching. The chloride content and corrosiveness of the spent reagents are minimized and underflow from the dechlorinator may be added to the black liquor recovery system, increasing the recovery of sulfides. Waste disposal problems and the consumption of water are also minimized by recycling free acid from the dechlorinator to the generator. Filtrate from the last stages of pulp washing is used as the absorption media in the chlorine dioxide absorption towers. (Sandoski-FIRL)
W76-07638

MINIMIZING CHEMICAL AND FINES BUILDUP IN WHITE WATER BY CHEMICAL MEANS,
Inst. of Paper Chemistry, Appleton, Wis.
D. G. Williams.
Tappi, Vol. 56, No. 12, p 144-147, December, 1973. 8 fig, 17 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Flocculation, Polyelectrolytes, Polymers, Adsorption, Coagulation.
Identifiers: Papermaking wastes, *Coflocculation.

The conditions necessary to minimize chemical buildup in white water of a papermaking process and to effect maximum retention of colloidal materials were examined. The coflocculation mechanism is most crucial as compared to sieving or mechanical attachment. Significant coflocculation is acheived through effecting the collapse of the electric double layers of the surface charged bodies with the provision of a suitable electrolyte concentration. The chemistry of aluminum salts in solution, the ability of its cations to effect coagulation, and the interference of complexing anions, such as sulfate, were discussed. Additional coflocculation is possible with the appropriate addition of a polyelectrolyte and the establishment of a polymer bridge. The success of the polymer retention aid is dependent upon achieving adsorption of polymer segments on the surfaces under conditions of low coverage and upon the ability of the created floc to withstand a shearing force in the process. Methods of implementing polymer adsorption and the effects of shear stress on flocculation in papermaking systems were also discussed. (Sandoski-FIRL)
W76-07639

OFFENSIVE ODOR TO BE REMOVED 99% BY OJI SYSTEM,
Japan Pulp and Paper, Vol. 11, No. 3, p 5, 1973.

Descriptors: *Pulp waste, *Waste water treatment, *Industrial wastes, Pulp and paper industry, Odor, Equipment, Biochemical oxygen demand, Incineration.
Identifiers: *Japan.

Oji Paper, Japan, has developed new odor abatement equipment with the trade name 'OK Stripping'. The unit can reduce 99% of offensive odor components in the waste water of the pulp and paper industry. At the same time, the system will remove 90% of the BOD in the wastes. The air and water with undesired odors are collected and then fed to a tower. In the tower, such materials as methanol and melkabutan are gasified by steam gas blown into the tower, and then incinerated. (Sandoski-FIRL)
W76-07640

LABORATORY MODEL STUDY OF THE EFFECTS ON THE AQUATIC MICROFLORA OF COAL-WASHING PLANT-GENERATED WASTE WATERS (SZENMOSO-UZEMI SZENNYVIZEK ELOVIZEKRE GYAKOROLT HATASNAK LABORATORIUMI MODELLVIZSGALATA),
For primary bibliographic entry see Field 5B.
W76-07641

A WATER QUALITY CONTROL PROGRAM,
Publishers Paper Co., Oregon City, Oreg.
C. Mayer, Z. Rozycki, and A. L. Caron.
Tappi, Vol. 57, No. 1, p 140-142, January, 1974. 5 tab.

Descriptors: *Waste water treatment, Pulp and paper industry, *Industrial wastes, Suspended solids, Biochemical oxygen demand, Treatment facilities, *Pulp wastes, *Oregon, Water quality control.
Identifiers: Municipal-industrial wastes, Willamette River(Ore).

Water quality conditions in the Willamette River, Oregon, required that the effluent load discharged by industrial and municipal sources be substantially reduced. Treatment systems were installed and an effective low-flow augmentation program was implemented. In-mill process changes were effected at the Newberg and Oregon City mills, first on a pilot scale and then construction over a five year period on a full plant scale. The result has been suspended solids and BOD reductions of 90 and 98%, respectively. New practices included conversion from calcium-base to magnelite pulp production, installation of a settleable solids removal system for white water, and the addition of an aerated stabilization basin system for removal of five-day BOD from mill effluents. (Sandoski-FIRL)
W76-07642

FILTRATION TECHNIQUES FOR PURIFICATION OF KRAFT PULP MILL AND BLEACH PLANT WASTES,
Oak Ridge National Lab., Tenn.
J. S. Johnson, Jr., R. E. Minturn, and G. E. Moore.
Tappi, Vol. 57, No. 1, p 134-138, January, 1975. 4 fig, 1 tab, 23 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Filtration, Reverse osmosis, Membrane processes, Membranes, Water reuse, Laboratory tests.
Identifiers: Ultrafiltration, Kraft pulping wastes, Cross flow.

Laboratory tests of filtration techniques for processing various kraft pulping streams were performed. The techniques included: high-pressure hyperfiltration (reverse osmosis) with dynamic membranes rather than conventional membranes, such as cellulose acetate; moderate-pressure, low-salt-rejection ultrafiltration; and filtration of chemically treated effluents at low pressures. In each case, the feed solutions were circulated parallel to the filtering surface; the cross flow method tends to reduce concentration polarization and inhibit fouling. Effluents tested included brown -stock wash, decker, and screen-room effluents, and bleach-plant effluent. For hyperfiltration, polyacrylate membranes formed on a sublayer of hydrous Zr(IV) oxide were used. In ultrafiltration, the membranes were single layers of hydrous Zr(IV) oxide or of neutral organic polymers. While results of these laboratory tests were encouraging, further research is necessary to determine if dynamic filtration techniques can successfully be applied to in-plant wastes. Costs will be a primary factor in determining the feasibility of these approaches. (Sandoski-FIRL)
W76-07643

THE PYROLYSIS OF EXTRACTED SOLIDS FROM OXIDIZED KRAFT BLACK LIQUOR AFTER LIGNIN PRECIPTIATION,
Lakehead University, Thunder Bay (Ontario). Dept. of Chemistry.
A. J. Bruley, W. G. Coodk, and R. A. Ross.
Canadian Journal of Chemical Engineering, Vol. 51, No. 6, p 746-750, December, 1973. 8 fig, 4 tab, 7 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Industrial wastes, Pulp and paper industry, Laboratory tests, Odor, Lignins, Chemical precipitation, Gas chromatography, Hydrogen sulfide, Analytical techniques, *Pollutant identification.
Identifiers: *Pyrolysis, Kraft black liquors, *Odor control.

A laboratory investigation was conducted on the possibilities for odor reduction from kraft mill stack gases by lignin precipitation from oxidized kraft black liquor and pyrolysis of the filtrate solids. Samples of oxidized black liquor were acidified with sulfuric acid and the lignin precipitate was extracted. The extraction scheme indicates that more than 90% of the sodium in the original black liquor samples can be retained in the filtrate after lignin removal at a final pH of 2.0. The evaporated filtrate solids containing the bulk of the black liquor inorganic chemicals were pyrolyzed; the evolved hydrogen sulfide, methyl mercaptan and dimethyl sulfide were monitored by gas-chromatography. A thermogravimetric technique was used to investigate the decomposition rates of the extracted samples. These rates correlated with the levels of sulfur gases evolved on pyrolysis. Heats of combustion were determined by bomb calorimetry. Sulfur losses from the filtrate solids and the kraft black liquor total solids were compared. Although the concentrations of organo sulfur gases from samples of lignin-extracted black liquor solids decreased through lignin precipitation, an increase in the level of hydrogen sulfide emission presents a problem for further research. (Sandoski-FIRL)
W76-07644

EFFLUENT STREAM TREATMENT.
French Patent FR 2173166. Issued October 5, 1973. Derwent French Patents Abstracts, Vol. U, No. 51, p F1, January 24, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Pulp and paper industry, Resins, Flocculation, Polymers, Coagulation, *Pulp wastes.

An effluent stream treatment process using P-F resin solution and a water-soluble polyether was patented. Waste waters, particularly from paper and fiberboard production, were treated with a solution of a P-F resin. The resulting flocs were very rapidly coagulated in the presence of the polyether. This water-soluble compound had a molecular weight greater than 50,000 and was usually polyethylene oxide with a molecular weight greater than 100,000. Cellulose fibers could be effectively removed from effluent waters. (Sandoski-FIRL)
W76-07645

PURIFICATION OF WASTE WATERS,
French Patent FR 2172935. Issued October 5, 1973. Derwent French Patents Abstracts, Vol. U, No. 50, p D7, January 17, 1974.

Descriptors: *Pulp wastes, *Waste water treatment, *Industrial wastes, *Patents, Pulp and paper industry, Suspended solids, Biochemical oxygen demand, Flocculation, Chemical precipitation, Sedimentation, Water purification.

A patented method of purification of waste papers from forest products, paper, or cardboard industries is described. The waste water consists of two parts: one having a high content of suspended matter and low content of oxygen-consuming material; and the other part having a low content of suspended matter and high content of oxygen-consuming material. Purification consisted of treating the first part to remove suspended matter. The residual liquid was then added to the second part. Precipitation agents were also added and the liquid was subjected to physical flocculation. Sedimentation and flotation products could be re-used in the process. Costs of the process and equipment were low, and small quantities of waste water could be treated. (Sandoski-FIRL)
W76-07646

FRESH AND WASTE WATER TREATMENT BY MEANS OF REVERSE OSMOSIS AND ULTRAFILTRATION AS COMPARED WITH OR AS A SUPPLEMENT TO THE ION EXCHANGE PROCEDURE (FRISCH UND ABWASSERAUFEREITUNG MIT UMGEKEHRTER OSMOSE UND ULTRAFILTRATION IM VERGLEICH MIT ODER ZUR ERGRENZUNG DER IONENAUSTAUSCHTECHNIK),
K. Marquardt.
Oberflaeche/Surface, Vol. 14, No. 11, p 338-341, November, 1973. 5 fig, 3 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Reverse osmosis, *Ion exchange, Dyes, Membrane processes, Hydrogen ion concentration.
Identifiers: *Ultrafiltration, *Metal processing wastes.

Possibilities of reverse osmosis and ultrafiltration either as self-contained processes or as supplements to ion-exchange procedures in the treatment of waste waters generated by the metal processing and surface coating industries are described. Reverse osmosis is suitable for the recovery of valuable substances from effluents without the use of excess amounts of chemicals, and in a rather low temperature range. The retention of zinc from zinc chloride-containing solutions was found to increase with decreasing pH values. The nitrate ion retention, highest (80-86%) in a pH range of 7-11.1, is also strongly dependent on the pH value, while the retention of ammonium ions is practically independent from the pH value in a range of 3.2-6.9. The highest retention rate determined for phenol in the pH range below 10 was 55%, it increased to 95% at pH 11. Ultrafiltration, possibly combined with reverse osmosis, is suitable for the separation of dyes, tensides, and higher-molecular alcohols. Contaminant concentrations exceeding one percent require multi-stage reverse osmosis units. (Takacs-FIRL)
W76-07647

TREATMENT METHOD FOR HEAVY METAL CONTAINING LIQUID WASTE (JUKINZOKU GANYU HAISUI NO SHORIHO),
M. Nakagawa.
PPM, Vol. 5, No. 2, p 50-56, February, 1974. 11 fig, 2 tab, 8 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, Iron, Evaporation, Sludge treatment, Recycling, Mercury, Adsorption, Liquid wastes.
Identifiers: *Metal finishing wastes, Cyanides.

For effective treatment of liquid wastes produced from metal surface treatment industries, waste liquid and sludge should be grouped into four systems: ferrous acid group and alkaline cleansing; non-ferrous acid group and alkaline cleansing; chromium; and cyanides. Cyanide wastes are first degraded by oxidation. The pH is then adjusted, chromium hydroxide is settled, and the supernatent liquid is discharged. For recovery of heavy metals from sludge, a dry method or wet method is applied. For sludge with a high iron content, the dry method of chlorination evaporation is effective. Calcium chloride is added to the sludge, which is then pelletized and roasted at a temperature over 1000 C; thus precious metals are recovered. For sludges with valuable metals other than iron, preliminary separation of metals by the wet method is desirable. First, the sludge is dissolved in sulfuric acid; or, when sludge has some iron, the iron should be suspended in water before being dissolved, and oxidized into ferric salt. Alkali is added to sulfuric acid solution and pH is adjusted to 1-2, gypsum is settled and eliminated, pH is readjusted to 3.5-4, and most iron settles in the form of basic salt. After iron is separated, the liquid is readjusted to pH 9-10, and zinc hydroxide is settled. When salt concentration is increased, the liquid can be used for producing mirabilite. If after eliminating gypsum the liquid is red in color because of a high chromium content, sulphite is added and the color is turned green; iron is settled, and zinc and chromium are settled together. Mercury-containing liquid and sludge are treated by sulfide ion, and mercury is recovered as mercury sulfide. (Seigle-FIRL)
W76-07648

REMOVAL OF COPPER FROM LIQUID EFFLUENTS,
Netherlands Patent NL 7206835. Issued November 21, 1973. Derwent Netherlands Patents Abstracts, Vol. U, No. 50, p D1, January 17, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Copper, Ammonia, Activated carbon, Reduction(Chemical), Liquid wastes.

A method for removal of copper from liquid effluents by treatment with ammonia and a reducing agent is described. The effluents are treated by: adding excess ammonia; adjusting the pH of the ammoniacal solution to greater than or equal to ten; and adding excess reducing agent to form a copper-containing removable sludge. Excess ammonia is added to form the copper-ammonia complex, the mixture is adjusted to pH greater than or equal to twelve with NaOH, and excess hydrazine is then added to form the sludge. After separating the sludge, the filtrate is treated with active charcoal to improve copper and excess reducing agent removal. The treated effluent may be discharged safely without danger to aquatic life or plants. (Sandoski-FIRL)
W76-07649

TREATMENT OF EFFLUENTS,
French Patent FR 2174256. Issued October 12, 1973. Derwent French Patent Abstracts, Vol. U, No. 51, p D5, January, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Heavy metals, Waste water disposal, Waste disposal.

A method of treating effluents containing heavy metals by a combination of high molecular compounds, concentration, and solidifying, was patented. Industrial effluents containing heavy metals in dissolved or powder form can be treated by mixing them with a liquid containing a high molecular water-soluble compound, such as polyvinyl alcohol, methyl cellulose, carboxy methyl cellulose, sodium alginate or sodium cellulose xanthate. The mixture is then concentrated by heating. After cooling, a solid layer containing the heavy metals will be produced, which is easily disposed. (Sandoski-FIRL)
W76-07650

HEAVY METAL RECOVERY METHOD AND TREATMENT OF PLATING LIQUID WASTE (MEKKI HAISUICHU NO JUKINZOKU KAISHU TO SONO SHORI),
H. Okuda.
PPM, Vol. 5, No. 2, p 44-49, February, 1974. 8 fig.

Descriptors: *Heavy metals, *Waste water treatment, *Industrial wastes, Metals, Membrane processes, Membranes, Reverse osmosis, *Ion exchange, Resins, Cation exchange, Anion exchange.
Identifiers: *Metal finishing wastes, *Japan, Metals recovery.

For treatment of liquid waste and metal recovery for the plating industry, the natural recirculation method, forced circulation method, single effect evaporator, multiple effects evaporator, and the steam compressor evaporator were discussed. The reverse osmosis, ion exchange resin, and condensation settling methods were compared. Reverse osmosis is still in the experimental stage in Japan. Liquid wastes containing metal salts are pressured at 40-70 kg/sq cm and passed through a membrane. The most widely used membrane is acetyl-cellulose; this is highly permeable for liquid and retains salt well, but it deteriorates quickly in a strong acid or strong basic solution. In a laboratory test, the nickel elimination rate for the plating liquid waste was approximately 99%; sulfuric acid radicals and chlorine ions can be eliminated up to 99%. However, the elimination of boric acid was only 30%. Therefore, when returning nickel salt to the plating bath, the boric acid content must be adjusted. In the ion exchange resin method of recovering metals, resin that has reached its exchange capacity is regenerated. For cation exchange resin, hydrochloric acid or sulfuric acid is used and for anion exchange resin, caustic soda is used. The recovery of chromium is effective by this method. When treating sludge, chromic acid solution is mixed with acid and the pH is adjusted to less than 3; sodium bisulfite is added and chromic acid is reduced; caustic soda is added and neutralized; chromium hydroxide concentrate is then produced, which can be filtered directly. (Seigle-FIRL)
W76-07651

COALESCENCE OF OLEOPHILIC LIQUID/WATER DISPERSIONS,
Netherlands Patent NL 7300380. Issued November 27, 1973. Derwent Netherlands Patents Abstracts, Vol. U, No. 50, p J1, January 17, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Oil, *Coalescence, *Ion exchange, Resins, Oil pollution, Emulsions, *Separation techniques, Dispersion, Exchangers.
Identifiers: *Oil/water separation, Oleophilic wastes.

A patented method for causing coalescence of oleophilic liquid/water dispersions using ion-exchanger beds is described. The coalescence of a dispersion of water and an oleophilic liquid is achieved by passing the dispersion through a bed of ion-exchange resin particles which have been equilibrated in relation to sorption of the oleophilic liquid. The dispersion may be one of a liquid petroleum hydrocarbon in water, and is passed upwards through the ion-exchange bed. The ion-exchange resin should be a strongly basic anion exchanger comprising quaternary ammonium groups attached to a styrene/divinylbenzene copolymer and/or a strongly acid cation exchanger comprising SO3H groups attached to a styrene/divinylbenzene copolymer. The process was especially useful for removing oil from waste waters and discharge from oil tankers. (Sandoski-FIRL)
W76-07652

APPARATUS FOR REMOVING SURFACE FILMS FROM LIQUIDS,
Peabody Engineering Corp., N. Y. (Assignee).
O. M. Arnold, and C. A. Vancini.
United States Patent 3,789,586. Issued February 5, 1974. Official Gazette of the United States Patent Office, Vol. 919, No. 1, p 55, February, 1974. 1 fig.

Descriptors: *Patents, *Waste water treatment, Scum, Waste disposal, *Separation techniques.
Identifiers: Funnels.

An apparatus to remove surface films from liquids was patented. A funnel located below the surface of a liquid and movable across the container was placed in a reservoir. A liquid jet arranged to cause the surface film or foam to flow into the funnel from which it is discharged to the outside was also provided. (Sandowski-FIRL)
W76-07653

RECOVERY OF CHEMICALS FROM SULFITE WASTE LIQUORS BY MEANS OF ELECTRODIALYSIS (CHEMIKALIENRUECKGEWINNUNG AUS SULFITABLAUGEN MIT DER METHODE DER ELEKTRODIALYSE),
J. N. Nepenin, and B. N. Filatow.
Zellstoff und Papier, Vol. 22, No. 11, p 331-335, November, 1973. 9 fig, 4 tab, 10 ref.

Descriptors: *Ion exchange, *Chemical industry, *Industrial wastes, *Waste water treatment, *Laboratory tests, *Electrodialysis, Membrane processes, Pulp and paper industry, Sulfite liquors, Recycling, Pulp wastes.
Identifiers: *Chemicals recovery.

The possibility of the chemical recovery from sodium-base sulfite liquor residues by means of electrodialysis with simultaneous fractionation of the lignosulfonic acids was studied in laboratory experiments. It was possible to recover chemicals with simultaneous fractionation of the residues from yeast recovery by electrodialysis, using ion

exchange membranes. The energy consumption was found to be lowest (50 kWh/kg of sodium), and the separation efficiency highest (60%) at a residue concentration of 30% dry matter, which is most probably due to a maximum of the electric conductivity of the residue at this concentration. The optimum current density was determined to be 50 ma/sq cm. An increase in the residue temperature from 20 to 80C resulted in an increase in the rate of sodium regeneration by 46 to 69%, an increase in the separation efficiency by 32 to 50%, and a decrease in energy consumption by nearly four times. To prevent backward diffusion from occurring, multi-stage operation with a maximum rate of sodium regeneration in the first stage of 74% is necessary. The increase observed in the electrophoretic mobility of the lignosulfonic acids from 1.48 to 3.84 cm/sV with a decrease in their molecular weight from 30,000 to 1,630 indicates the possibility of their fractionation in the electric field. A ten-chamber arrangement of the ion exchange membranes was preferred. (Takacs-FIRL)
W76-07654

GALLIUM ARSENIDE WASTE TREATMENT METHOD,
H. F. Bell, and G. Calley.
IBM Technical Disclosure Bulletin, Vol. 16, No. 8, p 2649, January, 1974.

Descriptors: *Industrial wastes, *Waste water treatment, Alkalinity, Liquid wastes, Chemical precipitation, Filtration, Chemical wastes.
Identifiers: *Gallium arsenide treatment, *Arsenic removal, Gallium.

The use of standard treatment procedures on waste gallium arsenide solutions did not result in consistent arsenic removal, and removed only 15% of the gallium in the waste. The following procedure takes into account the presence of hypochlorite and carbonate in the waste liquid, which cause the erratic results when the waste is treated in the conventional manner. First, alkaline waste is treated with 30% hydrogen peroxide to destroy all sodium hypochlorite present. Concentrated hydrochloric acid is then added to lower the pH to four, after which the solution is allowed to stand (with agitation) until the carbonate decomposes. The pH is then raised with lime (pH about 12) to precipitate the gallium and arsenic. Ferric chloride is added at this point to aid in the precipitation process. Finally, the material is filtered. (Sandoski-FIRL)
W76-07655

IN-PLANT WASTE ABATEMENT,
Allied Chemical Corp., Morristown, N.J.
W. M. Reiter, and W. F. Stocker.
Chemical Engineering Progress, Vol. 70, No. 1, p 55-59, January, 1974. 7 fig, 1 tab.

Descriptors: Chemical industry, *Waste water treatment, Lagoons, Suspended solids, *Recycling, Effluents, Treatment facilities, *Industrial wastes, Water reuse, *Chemical wastes, Mississippi River.
Identifiers: Alum, Phosphoric acid, Hydrofluoric acid, Zero discharge.

Allied Chemical has eliminated waste discharges from an alum plant, and is currently evaluating techniques for achieving zero discharge from its phosphoric acid and hydrofluoric acid facilities. To reduce discharge into the Mississippi River near New Orleans, a two-pond containment system was installed, pumping wastes to the first lagoon where suspended solids are removed, then to the second which functions as a clear well. The water goes back into the process as make-up for subsequent batches, completing a closed-loop operation. A recycling method for transport water used in HF manufacture involves neutralization of slurry and scrubber effluent; another treatment method being used in HF manufacture is dry handling of the HF furnace residue with concomitant elimination of aqueous waste. In the manufacture of phosphoric acid for fertilizer applications, acidulation of tricalcium phosphate is the main reaction. Acid water effluent from the process may be recycled with a 96% effectiveness. (Sandoski-FIRL)
W76-07656

INDUSTRIAL WASTE WATER TREATMENT.
Belgian Patent BE 799901. Issued January 24, 1974. Derwent Belgian Patents Abstracts, Vol. U, No. 51, p D2, January, 1974.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Electrolytes, Electrodes, Heavy metals.
Identifiers: *Cyanides, Electrolytic cells.

A patent for industrial waste water treatment using an electrolytic cell, applicable to the extraction of cyanides, was granted. A number of rows of parallel bar auxiliary electrodes are located between principal parallel plate electrodes. These form two side walls of the cell and increase the effective area of the electrochemical active surface. Thus, the voltage applied can be reduced, giving a higher efficiency due to reduction of gases. The bars are alternate carbon for the extraction of the cyanide, and a metal alloy which electrically dissolves the hydroxide of its own metals. Heavy metal ions are therefore extracted, and supported in an open box structure. (Sandoski-FIRL)
W76-07657

THE CONSTRUCTION OF AN INDUSTRIAL WASTE WATER DISCHARGE PIPE SYSTEM INTO THE SEA (BAU EINER INDUSTRIEAB-WASSER-LEITUNG INS MEER),
For primary bibliographic entry see Field 5E.
W76-07658

PLASTIC FILTERS FOR THE PURIFICATION OF DAIRY PRODUCT PROCESSING-GENERATED WASTE WATERS (KUNSTOSTOF FILTER-MODULES VOOR DE ZUIVERING VAN AFVALWATER, AFHOMSTIG VAN DE ZUIVELVERWERKING),
M. L. Hemming.
Voedingsmiddelentechnologie, Vol. 4, No. 47, p 34-35, November 21, 1973. 1 fig, 1 tab.

Descriptors: *Food processing industry, *Waste water treatment, *Biochemical oxygen demand, *Filters, Equipment, Plastics, Oxidation, Activated sludge, Industrial wastes, *Dairy industry, Filtration.
Identifiers: Polyvinyl chloride, Biofilters, BOD5.

The suitability and use of filter modules made of plastic materials for the purification of dairy-generated waste waters with high BOD5 loads are described. While older designs were made mostly of polyethylene, the modules are now made of polyvinyl chloride. Plastic filter modules are suitable for the treatment of dairy-generated waste waters in oxidation towers (percolation filters), and in conventional activated sludge units. For the percolation filters, the minimum input capacity is 1.47 cu m/sq m/h. Oxidative filtration by means of plastic filter modules can reach efficiencies of 90% or more in terms of BOD5 reduction. (Takacs-FIRL)
W76-07659

NEW ULTRAFILTRATION SYSTEM USES INORGANICS.
Chemical Engineering News, Vol. 52, No. 4, p 24-25, January 28, 1974. 1 fig.

Descriptors: *Membrane processes, *Industrial wastes, *Waste water treatment, Polymers, Food processing industry, Algal control, *Inorganic compounds, Economics, Carbon.
Identifiers: *Ultrafiltration, Ucarsep process.

Union Carbide has incorporated inorganic substances into its commercial ultrafiltration system called Ucarsep. Ucarsep consists of standard modules made up of bundles of porous carbon tubes coated on the inside with a series of inorganic compositions. The standard moddule is six inches in diameter and contains 151 tubes four feet long with a total working area of 37.5 square feet and daily production of 2,000 to 5,000 gallons of filtrate. Among its useful characteristics are ability to: process particles in the size range of 10 to 50 angstroms, and large polymer molecules of 10,000 to 50,000 molecular weight; and process material up to 200F, at a pH of 2 to 14, and a feed pressure of 600 p.s.i. Future applications include cheese whey protein recovery, latex concentration, detergent solution reuse, water recovery from black liquor, and algae removal. (Sandoski-FIRL)
W76-07660

METALFINISHING GETS AN ECOLOGICAL BOOST,
R. R. Irving.
Iron Age, Vol. 213, No. 5, p 50, February 4, 1974. 1 fig.

Descriptors: *Metals, Water pollution control, *Filtration, *Membrane processes, *Waste water treatment, Installation, Oil wastes, Carbon, Inorganic compounds, Pre-treatment(Water).
Identifiers: *Ultrafiltration, Ucarsep system, Metalfinishing wastes.

A new ultrafiltration process has been developed by the Union Carbide Corporation, called Ucarsep. The unit consists of carbon tubes, and the inner diameter of each tube is coated with an inorganic membrane. The process has been successful in treating wastes found in metal-working, particularly automotive and appliance manufacturing, and in coil coating. The system is being used on production lines for removal and concentration of oil from pre-paint detergent cleaning baths, oily waste streams and phosphating cleaning linesx. Oil is removed from a cleaning solution before it reaches the wate water treatment system. The typical 6000 gpd Ucarsep system, including pumps, controls, and modules can be mounted on a 2 ft by 4 1/2 ft base, and payback will range from less than six months to two years. (Sandoski-FIRL)
W76-07661

EFFECT OF TEMPERATURE ON CANNERY WASTE OXIDATION,
North Texas State Univ., Denton. Dept. of Microbiology.
G. R. Vela.
Journal Water Pollution Control Federation, Vol. 46, No. 1, p 198-203, January, 1974. 2 fig, 2 tab, 5 ref.

Descriptors: *Food processing industry, *Waste water treatment, *Waste disposal, *Biological treatment, Environmental effects, Irrigation, Microorganisms, Temperature, Bacteria, *Oxidation.
Identifiers: *Land disposal, Living filter system, Spray irrigation.

A spray irrigation waste disposal system developed by the Campbell Soup Company at Paris, Texas, was examined. Wastes from food processing (the cannery) are discharged into the soil, with a retention time of about 24 hours. Purification is the result of microbiological activity in the disposal field. The relationships between temperature, the growth of bacteria in soil, and oxidation of the waste water were illustrated. It was determined that the soil in the area of the disposal field had an autochthonous bacterial population, including obligate psychrophiles and obligate thermophiles. While these organisms contribute to the oxidative degradation of the plant waste water at extremes of temperature, the major portion of the oxidative capacity of the soil microflora came from the metabolic activities of the mesophilic

bacteria. The system, therefore, functions over a wide range of temperatures. (Sandoski-FIRL)
W76-07662

MUDDY WATER TREATMENT SYSTEM FOR AGGREGATE PLANT, (IN JAPANESE),
H. Ishii, and F. Komatsu.
Kobe Steel Engineering Reports, Vol. 24, No. 1, p 122-126, January, 1974. 7 fig, 3 tab.

Descriptors: *Mining, *Filters, Liquid wastes, Pilot plants, *Waste water treatment, Chemical precipitation, *Industrial wastes, Aggregates, Dewatering.
Identifiers: Japan.

Muddy water treatment in a closed system for the spiral classifier overflow of an aggregate crushing plant is described. The pollutants are the clay, top soil, and microparticle rock powder crushed in various crusher machines of the plant, more than 90 percent of which are less than 200 mesh (0.074 mm) particles. The concentration of solid in the liquid is extremely high (30,000-70,000 ppm). The solid amounts emitted are 1.5 tons per hour to 50 tons per hour at peak times. This creates a tremendous amount of slurry requiring precipitation and dehydration treatment. The precipitation separation divides the liquid into 20-40 percent slurry and supernatent liquid; slurry is then made into 50-80 percent solid cake by the dehydrater. Equipment of the closed muddy water treatment system designed by Kobe Steel, Japan, was described. The liquid waste treated in this completely closed system is never discharged outside the plant. Results of a preliminary test and the pilot plant were presented in tables and graphs. (Seigle-FIRL)
W76-07664

MAGNETIC SEPARATIONS NEAR MARKET BREAKTHROUGH.
Chemical and Engineering News, Vol. 52, No. 4, p 21-24, January 28, 1974.

Descriptors: *Pulp wastes, *Separation techniques, Pulp and paper industry, *Industrial wastes, *Waste water treatment, Potable water, Viruses, Magnetic studies, Steel.
Identifiers: High gradient magnetic separation(HGMS), *Magnetic separation.

High-gradient magnetic separation (HGMS) is a new and promising technology which may prove to be applicable in a wide variety of fields. The first and only commercial application of HGMS was in the clay industry. However, successfully tested HGMS units have been used in connection with paper mills, steel mills, and other industrial plants. Nonmagnetic impurities in effluents can be seeded to form magnetic agglomerates. Also, a cooperative effort by Harvard and MIT is being undertaken to remove viruses from drinking water by HGMS. (Murphy-FIRL)
W76-07665

A SOLUTION OF TRANSIT PROBLEMS ARISING IN PIPES CARRYING ENCRUSTATING AND SEDIMENTATING WASTE WATERS (LOESUNG VON TRANSPORTPROBLEMEN BEI INKRUSTIERENDEN UND SEDIMENTIERENDEN ABWASSERN IN ROHRLEITUNGEN),
W. Kuhn.
Gas-Wasserfach/Wasser-Abwasser, Vol. 114, No. 11, p 530-537, November, 1973. 11 fig, 7 ref.

Descriptors: *Pipes, *Pipelines, *Sewers, *Tannery wastes, *Waste water treatment, Cleaning, Treatment facilities, Odor, Economics, Industrial wastes.
Identifiers: *Leather factory wastes.

A solution to the problem of the conveyance of leather factory waste waters carrying encrusting and sedimenting materials in pressurized sewer pipes to a waste water treatment plant is described. Since an open sewer was unsuitable due to malodorous emissions from the effluents, pressurized sewer pipe with an inner diameter of 500 mm was chosen. To prevent encrustation and sedimentation inside the sewer pipes, these pipes were designed for regular cleaning by means of sewer scraper. Sewer scraping proved to be both economical and reliable. (Takacs-FIRL)
W76-07666

TREATING INDUSTRIAL WASTE WATER.
Belgian Patent BE 799386, Issued January 3, 1974.
Derwent Belgian Patents Abstracts, Vol. U, No. 48, p D1, January, 1974.

Descriptors: *Pulp wastes, *Patents, *Industrial wastes, *Waste water treatment, Pulp and paper industry, Chemical precipitation, Cellulose, Pretreatment(Water), Tannery wastes, Textiles, Filters.

A new method of treating industrial waste water with a cellulose-containing precipitating agent is described. Waste water is purified by contacting it with a cellulose-containing absorbing material which has been pretreated with a precipitating agent. The cellulose is generally in the form of a filter, pretreated with a polyanionic precipitating agent such as a dicyandiamide-formaldehyde or dicyandiamide urea-formaldehyde condensation product, alkylenepolyamines or dipolyamidepolyamidines made by reacting polymerized fatty acids with polyamines. The products are useful for removing impurities such as anionic dyes or optical bleaches from spent baths in the textile, paper and leather industries. (Murphy-FIRL)
W76-07667

THE SCAM (THE ENTERPRISES OF THE ELECTRO-MECHANICS COMP) AND THE RECYCLING OF INDUSTRIAL WATERS (LA SCAM ET LE RECYCLAGE DES EAUX INDUSTRIELLES).
Industires Alimentaires et Agricoles, Vol. 90, No. 9/10, p 1307, September/October, 1973. 1 fig.

Descriptors: *Industrial wastes, *Waste water treatment, *Recycling, Cooling water, *Water reuse, Water consumption.
Identifiers: Zero discharge.

Equipment for the cooling of industrial waste waters to be recycled is described. The atmospheric cooler operating in a closed cycle, and providing for direct contact between the waste water to be cooled and the air, has a water consumption amounting to only 2% of that of an open-cycle cooler. The minimum capacity of the unit lies at 70 cu m/h. Water consumption, and also direct contact between the water and the air can be fully suppressed by the use of another cooler composed of finned tube bundles. (Erdelyi-FIRL)
W76-07668

TERRITORY, INDUSTRIAL PLANTS, WATER SUPPLY, AND WASTE WATER PLANTS--PARTNERS IN JOINT INVESTMENTS (TERRITORIUM, INDUSTRIEBETRIEB UND VEB WAB--PARTNER GEMEINSAMER INVESTITIONEN),
F. Dimitrovici.
Wasserwirtschaft-Wassertechnik, Vol. 23, No. 12, p 423-426, 1973. 2 fig, 2 ref.

Descriptors: *Waste water treatment, Water supply, *Industrial wastes, *Biological treatment, Sludge treatment, Economics, Flocculation, Water treatment, Water purification.
Identifiers: Municipal-industrial wastes, Dyeing wastes, Chemical treatment.

A large dyeing plant and the public authorities for water supply and communal water purification in Erfurt, Germany, agreed on the joint treatment of the dyeing waste water along with domestic waste water for economical reasons. The following process stages were selected: balancing of the concentration of the dyeing waste water in the factory; mechanical and chemical purification of the dyeing waste water along with the domestic waste water; and sludge treatment and drying. The domestic waste water carries an organic load of 200 to 300 mg/liter; the industrial waste water after discoloration, 600 to 800 mg/liter at a temperature of 30 to 45 C. For mechanical purification, a long sand trap with hydromechanical removal of the solid matter was selected. For chemical purification, magnesium chloride lye is added for flocculation. Through addition of lime milk the pH of the waste water is raised from less than seven to more than ten. A uniform temperature of less than 35C is maintained throughout this process. The sludge from chemical treatment is dehydrated and then dried in drying beds. Of the 60 drying beds, 55 are used for industrial sludges and five for domestic sludges. The biological stage is supplied with waste water from the mechanical and chemical stages, and comprises three basins. (Erdelyi-FIRL)
W76-07669

DEVELOPMENT OF DESIGN GUIDELINES FOR SHIPBOARD SEWAGE HOLDING TANKS.
Abatement and Compliance Branch, Water Pollution Control Directorate Environmental Protection Service, Environment Canada, Ottawa, Canada, Economic and Technical Review Report EPS 3-WP-76-3, March, 1976, 101 p., 25 fig., 7 tab, 28 ref.

Descriptors: *Ships, *Design, *Sewage treatment, Operation and maintenance, Great Lakes, St. Lawrence River, Domestic wastes, Aerobic bacteria, Effluents, Sludge, Suspended solids, Waste water(Pollution), Costs, *Canada, Treatment facilities, Waste water treatment.
Identifiers: *Sewage holding tanks, Vessels, Grey waters, Flush waters.

A detailed study is presented of shipboard sewage holding tanks suitable for vessels engaged on the Great Lakes - Lower St. Lawrence River trade route. A range of designs has been developed to meet the needs of most ship types, crew sizes, trading patterns, stability criteria and sewage collection systems. Construction, operation, maintenance and safety aspects are analyzed with a view to optimizing the economic impact on vessels that choose total retention as a method of satisfying the requirements of the Great Lakes Sewage Pollution Prevention Regulations. (Environment Canada)
W76-07677

SLUDGE INCINERATION AND PRECIPITANT RECOVERY, VOLUME I, A SELECTIVE CODED BIBLIOGRAPHY,
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 5E.
W76-07678

DEVELOPMENT OF DESIGN GUIDELINES FOR SHORE -SIDE HOLDING TANKS.
T. A. Constantine, and P. J. Osmond.
Water Pollution Control Directorate, Environmental Protection Service, Environment Canada, Ottawa, Canada, Economic and Technical Review Report EPS 3-WP-76-2, January, 1976, 48 p, 4 fig, 1 tab, 3 ref.

Descriptors: *Design criteria, *Ships, Sewage, *Sewage treatment, Water pollution, Design, Capital costs, Operation and maintenance, Economics, Cost-benefit analysis, Water pollution sources, *Waste water treatment, *Treatment facilities.
Identifiers: *Holding tanks, Environmental protection.

Requirements for shore-side holding tanks receiving sewage collected on board vessels are discussed. Preliminary designs for a basic system and two variations are developed and capital cost estimates are presented. Operating procedures are outlined and estimated annual operating costs for the shore-side holding tank installations are provided. The main conclusion is that properly designed holding tank facilities will be very expensive to construct and operate and that, if possible, direct transfer of the sewage from the vessel to a shore-side sewer or treatment facility should be undertaken. If holding tanks are required, the system denoted as Alternative No. 3 is probably the most acceptable. (Environment Canada)
W76-07681

INVENTORY OF CANADIAN COMMERCIAL SHIPS ON THE GREAT LAKES.
Water Pollution Control Directorate, Environmental Protection Service, Environment Canada, Ottawa, Canada, Economic and Technical Review Report EPS 3-WP-76-1, January, 1976, 62 p, 17 fig., 7 tab., 2 append.

Descriptors: *Water treatment, *Waste water treatment, *Ships, Water pollution sources, *Great Lakes, Design criteria, Operation and maintenance, Prototypes, Testing, Model studies, On-site investigations, Systems analysis, *Canada.
Identifiers: Flow equalization, Carbon adsorption, Bio-oxidation, Clarification, Multimedia filtration, Ozonation.

Data contained in replies to questionnaires submitted to shipping companies are analyzed. The questionnaires were designed to produce an inventory of Canadian commercial ships operating in the Great Lakes / St. Lawrence Seaway region, their operating companies, the major characteristics of each ship, and the extent of vessel waste control problems in the area under study. A statistical breakdown of the questionnaire replies was made in an attempt to provide numerical data which may prove useful for other related studies. (Environment Canada)
W76-07682

SELECTED BIBLIOGRAPHY ON OZONE DISINFECTION,
Canada Centre for Inland Waters, Burlington (Ontario); and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Netzer, and H. K. Miyamoto.
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 29, Training and Technology Transfer Division (Water), Environmental Protection Services, Environment Canada, Ottawa, Canada, February 1976, 62 p.

Descriptors: *Bibliographies, *Ozone, Water purification, Water treatment, Potable water, Disinfection.
Identifiers: Ozone disinfection.

A selected bibliography of about 500 references on ozone disinfection has been compiled. References are listed in alphabetical order and a subject-author index is included. (Environment Canada)
W76-07683

FACTORS AFFECTING ACTIVATED SLUDGE TREATMENT OF KRAFT BLEACHERY EFFLUENT,
Department of the Environment, Ottawa (Ontario).
P. H. M. Guo, W. K. Bedford, and B. E. Jank.
Technology Development Report EPS 4-WP-76-1, 22nd Annual Ontario Industrial Waste Conference, Toronto, February 1976, 30 p., 11 fig., 7 tab., 16 ref.

Descriptors: *Sludge treatment, *Effluents, *Pulp and paper industry, *Treatment facilities, Waste water(Pollution), Sludge, Temperature, Aeration, Toxicity, Suspended solids, Bleaching wastes, Hydrogen ion concentration, *Waste water treatment.
Identifiers: Bleacheries, Detoxification, Kraft bleachery effluents, Sludge flocs, Nutrient addition, Pulp and paper mills.

Although activated sludge systems are used in the treatment of pulp and paper mill effluents, many factors which could affect their design and operation have not been identified. Extensive bench scale and pilot scale experimentation involving activated sludge treatment of kraft bleachery effluent have revealed a number of important factors related to the performance of the treatment systems. Bioassays carried out to investigate factors affecting the toxicity of kraft bleachery effluent during storage indicated that toxicity reduction was closely related to the sample pH. There was a significant detoxification of neutralized bleachery effluent samples during an eleven-day storage period. Aeration enhanced the rate of detoxification but the influence of storage, temperature and nutrient addition was negligible. Temperature significantly affected the concentration of effluent suspended solids of activated sludge systems treating kraft bleachery effluent. The study demonstrated that deterioration of effluent quality occurred at operating temperatures equal to or greater than 35 C. Increased effluent suspended solids were related to a continuous rising of pin-point flocs which was considered to be partially due to a temperature gradient in the clarifier. Elimination or inversion of the temperature gradient in the clarifier was successful in controlling the pin-point floc problem. (Environment Canada)
W76-07684

'CABOS' - NEW WASTEWATER TREATMENT SYSTEM FOR VESSELS,
Ontario Research Foundation, Sheridan Park.
H. Lomas, and A. R. Townshend.
Water Pollution Control Directorate, Environmental Protection Service, Environment Canada, Ottawa, Canada, Technology Development Report EPS 4-WP-76-2, February, 1976, 66 p, 12 fig., 15 tab, 9 ref., 2 append.

Descriptors: *Waste water treatment, *Ships, Water pollution sources, Great Lakes, Design criteria, Operation and maintenance, Prototypes, Testing, Model studies, On-site investigations, Systems, *Canada.
Identifiers: Flow equalization, Carbon adsorption, Bio-oxidation, Clarification, Multimedia filtration, Ozonation.

A system was designed for the treatment of black and grey water from commercial vessels to meet effluent quality requirements for undiluted discharge into the Great Lakes and other water bodies. Laboratory units and pilot plant models were constructed at the Ontario Research Foundation and tested under simulated shipboard conditions. The results of these tests were used in the design of a prototype unit which was constructed and installed aboard the SS John A. France, a bulk carrier owned and operated by Scott Misener Steamships Limited. The system incorporates flow equalization, carbon adsorption bio-oxidation, clarification, multimedia filtration, and ozonation. It is called the CABOS system. Operations such as cleaning of the clarifier and backwashing of the filter are controlled automatically. Field testing and system evaluation under actual shipboard conditions will be undertaken during the 1975 sailing season. (Environment Canada)
W76-07685

TWO TRILLION OR THREE: THE COST OF WATER QUALITY GOALS,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5G.
W76-07686

COST EFFECTIVENESS OF REGIONAL WATER QUALITY MANAGEMENT: SOME SELECTED CASE STUDIES AND GENERAL IMPLICATIONS,
Manhattan Coll., Bronx, N. Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-07687

FINANCING AND CHARGES FOR WASTEWATER SYSTEMS: ACTIVITIES OF THE JOINT WPCF/ASCE/APWA COMMITTEE,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 5G.
W76-07689

DYNAMICS OF THE PURIFICATION OF DOMESTIC FECAL SEWAGE ON SEWAGE FARMS, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny, Vilnius (USSR).
A. K. Baubinas, and V. V. Vlodavets.
Gig Sanit. 4, p 100-101, 1974.

Descriptors: *Sewage treatment, *Waste water treatment, Domestic wastes, *Sprinkling irrigation, Salmonella, Shigella, *Pathogenic bacteria, Epidemiology, Drainage, Water purification.
Identifiers: Salmonella-Eastbourne, Salmonella-Heidelberg, Shigella-Sonnei.

The dynamics of purification of domestic sewage on sewage farms with overhead sprinkling irrigation was studied. The most intense purification of sewage from chemical and bacterial contaminants occurs within the 1st hours after irrigation. Reliable purification of the sewage from pathogenic microorganisms (Salmonella eastbourne, Salmonella heidelberg, Shigella sonnei) is not provided in the case of overhead irrigation at a rate of 350 m3/ha on the sewage farms during maximum runoff of the drainage water, and the discharge of such runoffs into surface waters is epidemiologically hazardous. A decrease of the irrigation rate, increase of the filtering layer of soil and reuse of the drainage runoffs would promote an increase of the effectiveness of treating sewage on sewage farms.--Copyright 1975, Biological Abstracts, Inc.
W76-07692

METHOD OF ELECTROLYTIC TREATMENT OF WASTE WATER,
Mitsui Mining and Smelting Co. Ltd., Tokyo(Japan). (Assignee).
M. Ishii, and M. Ichiki.
United States Patent 3,783,114. Issued January 1, 1974. Official Gazette of the United States Patent Office, Vol. 918, No. 1, p 415, January, 1974. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Electrolysis, Heavy metals, Electrolytes, Electrodes, Oil wastes, Anodes, Cathodes.

A patent has been granted for a method of electrolytic treatment of industrial waste water. The electrolysis is conducted by introducing the industrial waste water as the electrolyte into an electrolytic cell equipped with vertically suspended anodes and horizontal cathodes positioned near the bottom of the cell. The scum arising from the electrolysis of the heavy metal ions, fats and oils including animal, vegetable and mineral oils, various fine, solid floating matters is removed from the upper part of the electrolytic cell. The electrolytically purified waste water is removed from the lower part of the electrolytic cell. (Sandoski-FIRL)
W76-07707

STUDIES ON THE TREATMENT OF WASTEWATER FROM FOOD PLANTS WITH ACTIVATED CARBONS. PART I. MODEL EX-

PERIMENTS ON ADSORPTION OF TYPICAL ORGANIC COMPOUNDS, (IN JAPANESE),
National Food Research Inst., Tokyo (Japan).
M. Sugimoto, M. Takagi, and H. Yoshii.
Nippon Shokuhin Kogyo Gakkaishi, (Journal of Food Science and Technology), Vol. 20, No. 7, p 229-303, 1973. 7 fig, 1 tab, 16 ref.

Descriptors: *Adsorption, *Activated carbon, *Organic compounds, *Food processing industry, *Waste water treatment, Model studies.
Identifiers: Freundlich adsorption isotherm, Starch.

The adsorption capacity of activated carbons was evaluated using several kinds of organic substances. Adsorption capacity and rate were represented by the Freundlich adsorption isotherm. For powdered activated carbons 1/h values were as follows: phenylalanine 0.2-0.3; soluble starch and methionine 0.4-0.6; glucose 0.5-0.6; lactic and glutamic acid 0.6-1.0; and, polypeptone 1.3-1.8. And for granular activated carbons these values were: phenylalanine 0.3; lactic acid, methionine, glutamic acid and glucose 0.5-0.7; polypeptone 1.0-1.4; and, soluble starch 0.37 and 2.84. The amount of activated carbons required for removal of those solutes to 80 percent level in 100 ml solution, showed the lowest value (0.5-0.9 g) in case of phenylalanine with both powdered and granular carbons, and the highest value (above 10 g in case of soluble starch) with granular carbon. (Murphy-FIRL)
W76-07708

DECHLORINATION OF MUNICIPAL SEWAGE USING SULFUR DIOXIDE,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
For primary bibliographic entry see Field 5C.
W76-07715

AN ACTUAL EXAMPLE OF WASTE WATER TREATMENT IN A PETROLEUM FACTORY,
H. Tada.
In: Proceedings of the 1974 All-Japan Pollution Control Technical Conference, Tokyo, Japan, June 10-14, 1974. p 11-20, 6 fig, 6 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil wastes, Treatment facilities, Polymers, Aeration, Activated sludge, Biological treatment, Costs, Maintenance, Biochemical oxygen demand, Suspended solids.
Identifiers: Petroleum factory wastes.

The first stage of the Oita petrochemical complex was completed in June of 1969 with the construction of the ethylene center and annual production of 150 kt ethylene. The liquid waste produced in this complex comprises waste water from the monomer, polymer, cracker, and utility plants. With the exception of the monomer plant, which is acidic, the others are neutral; suspended substances are high in the polymer and utility plants; oil is high in the cracker plant; and BOD is high in the monomer and cracker plants. Pressure flotation treatment is applied to the waste water from the polymer and cracker plants, and a further biological treatment is given to the latter. Utility water is treated by settling, and waste water from the monomer plant is neutralized and then biologically treated. For biological treatment, one system uses an aeration activated sludge tank while the other uses a UNOX activated sludge tank. UNOX aeration, with a high purity oxygen atmosphere, can tolerate heavy loads and concentration shocks. UNOX can treat a load of BOD-SS about three times heavier than normal with 2-3 times more BOD volume and still achieve a 99% BOD removal. The maintenance, measurement and analysis methods, treatment costs, and future expansion plans of this water treatment system were also discussed. (Seigle-FIRL)
W76-07717

METHODS AND COSTS OF INDUSTRIAL EFFLUENT TREATMENT,
Ciba-Geigy Limited, Duxford, Cambridge, Environmental Technical Services Group.
K. G. Singleton.
Chemistry and Industry, No. 6, p 233-237, March 20, 1976. 1 fig, 5 tab, 7 ref.

Descriptors: *Chemical industry, *Waste water treatment, *Industrial wastes, Waste discharge, Economics, Water pollution control, Effluents, Plastics, *Costs, Design, Treatment facilities.
Identifiers: *Synthetic resin industry wastes.

Economics have become a significant criterion in the evaluation of industrial effluent treatment in Great Britain. In the synthetic resin industry, the Duxford site of the Plastics Division of Ciba-Geigy (UK), Limited, has designed its treatment facilities from an economic standpoint. Waste waters from the factory contain methanol for-maldehyde, and phenol, as well as traces of resin in solution and suspension. These organic effluents are diluted, and domestic sewage from the neighboring area is added. The combined wastes are pumped from a storage lagoon to a completely mixed activated sludge plant. Air is supplied by a mechanical surface aerator. Primary activated sludge is followed by secondary activated sludge and biological filters in parallel. Excess cooling water from the factory is used for dilution of the treated effluent before discharge into the River Cam. In order to treat the chemical wastes most economically, all new products are evaluated at the laboratory bench and any byproducts are considered for possible recycling. Waste materials are analyzed and a pollution load factor is established as a percentage of the existing load to the effluent treatment plant. With Duxford's policy of reclamation before degradation, savings in recovered raw materials have accounted for almost two times the annual operating costs for the plant. (Kramer-FIRL)
W76-07740

EXTRACTION OF (NITRO-) PHENOLS FROM AQ. STREAM USING NITROBENZENE.
Belgian Patent BE 830-558. Issued December 24, 1975. Derwent Belgian Patents Abstracts, Vol. X, No. 2, p D3, February, 1976.

Descriptors: *Phenols, *Nitrogen, *Patents, *Waste water treatment, *Chemical wastes, Chemical industry, Water pollution sources, *Industrial wastes, Separation techniques.

A method for treating effluents from the production of nitrobenzene by reaction of benzene with HN03/H2S04 has been patented. The process is used for the separation of mono- and trinitrophenols, phenol, cresol, xylenol, resorcinol, pyrogallol, and tetrahydroxy-benezenes. Phenol or nitrophenol may be extracted from the aqueous stream by completely mixing nitrobenzene with the aqueous stream, where the pH of the water contained in the mixture is below 5 and the ratio of nitrobenzene to phenols is at least equal to the saturation ratio. This mixture is then separated into a raffinate containing water free of phenols and an extract containing the phenols dissolved in nitrobenzene. This extraction is accomplished at 5 to 75 C. (Kramer-FIRL)
W76-07741

OZONE WITH ULTRAVIOLET LIGHT PROVIDES IMPROVED CHEMICAL OXIDATION OF REFRACTORY ORGANICS,
Houston Research Inc., Tex.
C. E. Mauk, and H. W. Prengle, Jr.
Pollution Engineering, Vol. 8, No. 1, p 42-43, January, 1976. 2 fig, 1 tab.

Descriptors: *Ozone, *Organic compounds, *Waste water treatment, *Ultraviolet radiation, Oxidation, Industrial wastes.
Identifiers: *Cyanides.

Previous research on the combination treatment by ozone and UV to destroy cyanides has been quite successful. For example, the U.S. Air Force has designed and is building a full scale prototype to reduce complexed cyanide from 50,000 mg/liter to a total cyanide concentration below limits of detection in electroplating waste water. A more recent use of ozone-UV treatment is in the oxidation of refractory organic compounds in secondary waste water effluents. In this investigation, ethanol, glycerol, acetic acid, glycine, and ammonium palmitate were chosen for treatment. Concentration of 100 mg/liter and lower were treated with ozone-UV in deionized water; typical removal curves are provided. Data on ozone autodecomposition, mass transfer, and reaction rates have also been collected. The use of UV with ozone enhanced the reaction until it offset the effect of greater ozone autodecomposition; the TOC of all the test solutions were quickly reduced to below the detectable limit. (Kramer-FIRL)
W76-07742

WASTE WATER TREATMENT IN PAINT WORKS,
G. Coppa-Zuccari.
Polymers, Paint and Colour Journal, Vol. 166, No. 3916, p 114-115, February 11, 1976. 3 tab.

Descriptors: *Chemical wastes, *Waste water treatment, *Treatment facilities, *Paints, *Chemical industry, Color, Oil wastes, Industrial wastes.
Identifiers: Paint industry wastes, *Italy.

The treatment of paint polluted waters and container wash waters from paint plants in Italy has been studied. Treatments differ for two types of paints, solvent-based and water-soluble. Because the containers used for solvent-based paints undergo cleaning with other solvents, the resulting waste is rich in solvents. This waste is removed for recovery by distillation and the residual sludges are incinerated. Containers used for water-soluble paints are spray washed with hot water. Waste waters from the washing process are collected in tanks having a three hour retention time capacity. Complete clarification, with the exception of COD and petroleum ether extractible substances, can be obtained with the addition of alum and filtering. When no surface active agents (such as the petroleum ether extractible substances) are present, the wastes may then be treated with simple activated sludge, recycled, and discharged to a sewer. (Kramer-FIRL)
W76-07743

MICROBIOLOGICAL DEGRADATION OF PHENOL IN THE EFFLUENT FROM A WOOD TREATMENT PLANT,
North Texas State Univ., Denton. Dept. of Biological Sciences.
G. R. Vela, and J. G. Rainey.
The Texas Journal of Science, Vol 27, No. 1, p 197-206, March, 1976. 1 fig, 7 tab, 11 ref.

Descriptors: *Chemical wastes, *Waste water treatment, *Phenols, *Industrial wastes, Organic compounds, Effluents, *Biodegradation, *Wood wastes.
Identifiers: Wood preserving industry, Creosote, Pentachlorophenol.

Laboratory studies have been conducted on the parameters for bacterial degradation of effluent from wood preserving plant. Preservatives such as creosote and pentachlorophenol contain many phenol derivatives as well as large amounts of heavy oils. Microbial populations that degrade such contaminants vary as a function of time; there is also a variation in the type and concentration of contaminants. The complex kinetics of this system were investigated at the treatment yard of a wood preserving plant in North Texas. Result indicated that a high degree of autopurification in the aerated effluent may be enhanced by proper

conditions. Such conditions include proper temperatures, adequate aeration, and maintenance of large microbial populations. The design for a treatment facility has been derived from these criteria and data are being collected on the system's efficiency. (Kramer-FIRL)
W76-07744

POLYMER PLASTICISERS PRODUCTION EFFLUENT TREATMENT.
German Patent DS 2426-548. Issued November 20, 1975. Derwent German Patents Abstracts, Vol. W, No. 48, p D2, January, 1976.

Descriptors: *Patents, *Waste water treatment, *Polymers, *Plastics, *Industrial wastes, *Water pollution control.
Identifiers: Plasticizers.

A patent has been granted for a process which treats effluents from the production of polymer plasticizers. Effluent from the esterification of polybasic aliphatic/aromatic acids with aliphatic alcohols in the presence of an H2S04 catalyst contains alkyl sulphonic acids and dialkyl sulfates. This effluent is purified by heating it to at least 220 C at ambient pressure, followed by separation after previous acidification. The end product may be used as a plasticizer, such as for polyvinyl chloride. The process, therefore, allows the organic products in the effluent to be recovered and recycled and eliminates the need for costly separation and purification stages. (Kramer-FIRL)
W76-07745

A TWO-STEP PROCESS FOR TOXIC WASTEWATERS,
Zimpoo Inc., Rothschild, Wis.
A. R. Wilhelmi, and R. B. Ely.
Chemical Engineering, Vol. 83, No. 4, p 105-109, February 16, 1976. 10 fig.

Descriptors: *Toxicity, *Biological treatment, *Waste water treatment, *Chemical wastes, *Oxidation, Industrial wastes, Chemical industry.
Identifiers: *Acrylonitrile wastes, Wet-air oxidation.

Chemical wastes, such as those from the manufacture of acrylonitrile, are often biologically refractory or toxic to treatment microorganisms. Because of their large flow volumes and low heat values, incineration is a costly method of treatment. In the United States, such wastes are commonly disposed of by deep-well injection, but new legislative pressure has discouraged this disposal method. Three basic two-step processes have proven successful for treating such wastes. The processes are: wet-air oxidation followed by biological treatment; biophysical treatment, with wet-air oxidation used to regenerate the powdered carbon; and wet-air oxidation with biophysical treatment. Choice of system depends upon such factors as corrosiveness, ease of oxidation, toxicity, and economics. The performance each of these processes is detailed, in terms of BOD and COD reduction and solids concentrations. (Kramer-FIRL)
W76-07746

WASTEWATER TREATMENT IN SMALL TEXTILE FINISHING PLANTS A PROCEDURAL SYSTEM. (ABWASSERBEHANDLUNG IN KLEINEREN TEXTILVEREDLUNGSBETRIEBEN--EIN VERFAHRENSSYSTEM),
J. Fr. Gruhler, K. Halle, and F. R. Preuss.
Wasserwirtschaft-Wassertechnik, Vol. 26, No. 2, p 55-59, February, 1976. 7 fig, 11 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Flocculation, Color, Chemical oxygen demand, Flotation.
Identifiers: Ferrous sulfate.

Complex waste water treatment is proposed for small textile plants that cannot utilize the municipal sewer system for waste water discharge. To reduce the costs of production and treatment, it is necessary to reduce the water consumption within technologically feasible limits. Further, waste water treatment may be facilitated by the separation of concentrated waste waters and dilute effluents which later may be recirculated within the process after special treatment. Concentrates should be collected in mixing and equalization tanks for the shortest possible time, usually not longer than one hour, to avoid anaerobic processes. Waste waters are then subjected to mechanical chemical treatment, adopting the continuous flotation method with ferrous sulfate as flocculating agent. The optimal dosage is 1,250 g of hydrated FeSO4 per cu m of concentrate. The sludge is dewatered in drained drying beds with layer thicknesses of up to 1.80 m. The reductions that can be achieved by the flotation method are 95% alkalinity, 65% detergent concentration, 95% color and BOD5 content, 70% COD value (as determined by the permanganate method), and 100% sulfide concentration. (Takacs-FIRL)
W76-07747

WATER PURIFICATION PROCESS,
Hoechst A. G., Frankfurt am Main (West Germany).
J. W. Lehmann, K. Tannus, and A. Lehinant.
United States Patent 3,947,353. Issued March 30, 1976. Official Gazette of the United States Patent Office, Vol. 944, No. 5, p 2452, March, 1976.

Descriptors: *Patents, *Textiles, *Waste water treatment, *Industrial wastes, *Flocculation, Aluminum, Iron, Water purification, Chemical precipitation.

In the treatment of textile waste water, an aluminum or iron salt is often added as an inorganic flocculant to remove suspended and colloidal matter and large molecule anions. A new method was patented for use in treating textile waste waters containing 0.1 g/liter or more of dissolved sodium silicate (Na20.4SiO2), which interferes with the conventional flocculation process. This method consists of maintaining a pH between 7 and 8.5 and adding to the waste water about one mol of a monoamine or an acid salt of a monoamine plus about one-half mol of a diamine or its acid salt per mol of sodium silicate. (Kramer-FIRL)
W76-07748

WASTE WATER TREATMENT METHOD BY WATER-SOLUBLE POLYMER CONDENSATION BODY (SUIYOSEI KOBUNSHI SHUKUGOTAI NI YORU HAISU SHORIHO),
M. Takato, and M. Nishiyama.
Japanese Patent 51-957. Issued January 12, 1976. 2 p.

Descriptors: *Waste water treatment, *Textiles, *Polymers, Color, Industrial wastes, Organic compounds, Treatment facilities, *Patents.
Identifiers: Alum, Nylon dyeing wastes.

A patent has been issued for a method of waste water treatment using a hydrophilic condensation polymer. This polymer is synthesized from tannic acid and formalin in the presence of a naphthalic-tanning dispersing agent. The polymer obtained may be used to coagulate proteins, metal salts, and organic compounds in the waste water from textile and dyeing factories when used together with alum or polyacrylic resins. Waste water was obtained from a dye manufacturing factory, containing 0.5% solid components; it was slightly turbid with a pH between 7.2 and 7.4 and a brown color. When 200 parts waste water were treated with 5 parts 1% condensation polymer solution and 0.1% polyacrylic acid resin solution at normal temperature, the treated liquid was transparent and color was significantly lightened. The pH of the treated liquid remained the same as before the treatment, while more than half of the solid components were removed. The method was also applied to the treatment of waste water from a nylon dyeing factory. After 200 parts of slightly turbid liquid wastes of a light red-brown color were treated with 1.5 parts 1% condensation polymer and 3 parts 1% alum solution, the resulting treated liquid was colorless. (Katayama-FIRL)
W76-07749

NEW GAS HEATING AND ECONOMIC WASTE WATER PURIFICATION SYSTEM (NEUE GASHEIZUNG UND KOSTENGUENSTIGES ABWASSERREINIGUNGSSYSTEM),
M. Stadelmann.
Textilveredlung, Vol. 11, No. 1, p 25-28, January, 1976. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Economics, Costs, *Neutralization, Water purification.
Identifiers: Flue gases, Neutralization.

A new method for the neutralization of alkaline waste waters generated in the dyeing unit of the textile mill Baumann Weberei und Faerberei AG, Langenthal, Switzerland, is described. The alkaline waste water to be neutralized is sprayed into the flue gases of a natural gas-fired steam generator furnace. The carbon dioxide present in the flue gases neutralizes the waste waters, with sodium carbonate and dicarbonate as reaction products. The neutralized waste water has a pH between 7.2 and 8. No pH control is necessary, and the high residual CO2 content of the spent flue gas (50-66%) guarantees reliable neutralization even in the case of peak loads. (Takacs-FIRL)
W76-07750

REMOVAL OF CHROMIUM AND ZINC FROM EFFLUENT.
French Patent FR 2265-692. Issued November 28, 1975. Derwent French Patents Abstracts, Vol. X, No. 3, p D5-D6, February, 1976.

Descriptors: *Waste water treatment, *Zinc, *Chromium, *Metals, Flocculation, Polyelectrolytes, Industrial wastes, *Patents, Effluents.
Identifiers: *Galvanizing plant wastes.

A method has been patented for the removal of zinc and/or chromium from galvanizing plant wastes. The initial solution is made alkaline (pH between 9 and 10) by the addition of a flocculant or polyelectrolyte. Chromium is then partially reduced to the tervalent state by means of a reducing agent such as sodium bisulfite and the zinc and chromium are precipitated. The remaining solution is drawn off with a pump, thus completely removing the zinc and chromium, and avoiding their discharge into natural waters. (Kramer-FIRL)
W76-07751

THE PORI PROCESS: REGENERATION OF HYDROCHLORIC ACID FROM SPENT PICKLE LIQUOR,
Wean United, Inc. Warren, Ohio.
J. W. Burtch.
Wire Journal, Vol. 9, No. 2, p 57-59, February, 1976. 7 fig.

Descriptors: *Waste water treatment, *Pilot plants, *Treatment facilities, Steel, Recycling, Water reuse.
Identifiers: *Hydrochloric acid, Pickle liquors.

A process has been developed by Pori, Incorporated, for the regeneration of hydrochloric acid from spent steel mill pickling solutions. A sequence of several unit operations is involved in the Pori process. Equipment consists of an evaporator, an oxidizer, a hydrolyzer, the falling film condenser absorber system, a tail gas scrubber, a moving bed filter, and necessary

pumps, storage tanks, and utilities. The technology has been tested at the pilot plant level for two years and the first commercial full scale plant, which is capable of processing 30 gpm of spent HCl pickling liquor, is now under construction. The regeneration plant, being built at J and L Steel Corporation of Cleveland, will process spent pickle liquor from two existing pickle lines; no modifications in the plant operating processes are required. This low temperature process will produce high strength acid and will eliminate the needs to install heat exchangers in pickle lines and to control concentrations of the components in spent pickle liquor. In addition, salable or usable products, such as FeC13 and Fe203 will be produced. (Kramer-FIRL)
W76-07752

CYANIDE COMPOUND RECOVERY BY IMPACT METHOD AND REUSE OF WASTEWATER (SHOGEKIHO NI YORU SHIANKAGOBUTSU NO KAISHU TO HAISUI NO SAIRIYO),
S. Abe, and Y. Hanami.
PPM, Vol. 7, No. 3, p 33-40, March, 1976. 7 fig, 4 tab, 5 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Water reuse, *Recycling, Metals, Filters, Operating costs, Treatment facilities.
Identifiers: *Cyanide compounds wastes.

Treatment of cyanide compounds by the impact method for metal plating waste water is described. The operation is based on the formation of hydrogen cyanide from metal cyanide compounds by adjusting the waste water pH with sulfuric acid. With decreased pH, hydrogen cyanide was formed in the solution, and dissolved HCN could be separated from the solution by an impact apparatus. The sollution was sprayed onto a high speed rotating disc; the impact then liberated HCN gas, which was absorbed by the sodium hydroxide solution. In one case, 90% cyanide ion in sodium cyanide solution could be converted to HCN at pH 8, and nearly 100% of the cyanide ion could be converted at a pH below 6. The metal cyanide which did not form HCN remained in the solution and could be separated from the solution by a filtering device. The recovered metal cyanides could be then reused in the plating bath solution; the filtered solution could be reused as the rinsing solution in the plating process. Thus, a closed system of a plating waste water treatment was possible. The operating costs for this treatment method are lower than for the hypochlorous acid method. For the treatment of 47,800 ppm cyanide in the waste water of a zinc plating process, the operating cost of the treatment using the hypochlorous acid method was $3.88/day; with the impact method, costs were $0.28/day to treat the same waste water. (Katayama-FIRL)
W76-07753

STUDIES CONCERNING IMPROVEMENT OF WASTE WATER TREATMENT IN THE NICKEL PLANT AUE (UNTERSUCHUNGEN ZUR VERBESSERUNG DER ABWASSERBEHANDLUNG IN DER NICKELHUETTE AUE),
G. Fersterra, and G. Schmiedel.
Wasserwirtschaft und Wassertechnik, Vol. 26, No. 1, p 7-9, 1976. 1 fig, 1 tab, 19 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Metals, *Nickel, Pilot plants, *Copper, Dewatering, Sedimentation, Flocculation, Separation techniques.
Identifiers: Vacuum drum filters.

Laboratory and pilot experiments were conducted to establish the optimal conditions for the separation of nickel and copper compounds from waste waters generated in a nickel smeltery at Aue for subsequent recovery. Gravitational separation in continuous operation was chosen as the most feasible method of treatment. Laboratory tests revealed the suitability of aluminum sulfate and Stipix N 80 as flocculating agents. However, pilot plant experiments revealed no substantial difference in efficiency with or without the use of flocculating agents. Therefore, a continuous gravitational sedimentation method without flocculating agents was chosen. The optimal conditions were a pH value of 9.5, and a sedimentation rate of 0.13 m/hour. The sludge containing copper and nickel will be dewatered in a vacuum drum filter for metal recovery. (Takacs-FIRL)
W76-07755

IRON-CONTAINING ACID WASTE WATERS TREATMENT.
French Patent FR 2261-984. Issued October 24, 1975. Derwent French Patents Abstracts, Vol. W, No. 50, p D4, January, 1976.

Descriptors: *Waste water treatment, *Patents, *Iron, *Metals, *Industrial wastes, *Steel, Recycling, Water reuse, Neutralization, Oxidation.
Identifiers: Magnetite.

A process has been patented for the treatment of waste water from the production of steel. Iron-containing waste waters which also contain HCl, HF, and/or H2SO4 are treated at ambient temperatures (at least 21 C) with a neutralizing agent such as NaOH or Ca(OH)2. This will maintain a waste water pH at which iron is precipitated almost completely. The mixture is then stirred and aerated to oxidize 60 to 70 weight percent of the precipitate and to convert the ferrous precipitate into hydrated magnetite. The magnetite can be dried and processed for recycling as a sintered charge or as magnetite Fe powder. (Kramer-FIRL)
W76-07756

USING WASTES FOR WASTE CLEANUP.
Chemical Week, Vol. 118, No. 13, p 32, March 31, 1976.

Descriptors: *Oil wastes, *Waste water treatment, *Recycling, Sludge, Industrial wastes, New Jersey.
Identifiers: Spent oil refinery catalysts, Sodium aluminate.

The process for regenerating spent oil refinery catalysts at Matthey Bishop, Incorporated, in Winslow, New Jersey, yields as a by-product sodium aluminate solution. In the leaching of precious metals from catalysts, 50% sodium hydroxide solution is added and the mixture is reacted in an autoclave. After double filtration, the precipitated sludge contains the precious metals with sodium aluminate as the filtrate. This by-product will be sold to industrial plants to supplement alum in their waste water treatment processes. Pilot scale tests have shown sodium aluminate to be an efficient coagulant aid in the clarification of waste water, matching the suspended solids and phosphate removal of alum. Sodium aluminate also prevented the pH depression caused by acid salts of aluminum, lowered the total dissolved solids of the effluent, increased the floc formation rate of treated wastes, and reduced the effluent BOD. While two years ago the company was unaware of the possibility of the waste treatment market as an outlet for its catalyst recycle waste, current plans are to market one million gallons of sodium aluminate per year. (Kramer-FIRL)
W76-07757

STUDY ON THE REMOVAL OF AROMATIC HYDROCARBONS FROM INDUSTRIAL WASTEWATERS BY MEANS OF ACTIVATED CARBON (STUDIO PER LA RIMOZIONE DI IDROCARBURI AROMATICI DA ACQUA DI SCARICO INDUSTRIALI TRAMITE CARBONI ATTIVI),
G. Goretti, M. Massi, B. M. Petronio, A. Bertoldi, and A. J. Panagiotou.
Inquinamento, Vol. 17, No. 12, p 20-24, December, 1975. 6 fig, 2 tab.

Descriptors: *Organic compounds, *Waste water treatment, *Activated carbon, *Industrial wastes, *Chemical wastes.
Identifiers: Hydrocarbons.

The first step in removing aromatic hydrocarbons from industrial waste waters with activated carbon is the grinding of the carbon into a fine powder. Following drying, the powder is mixed into a water solution containing only the hydrocarbons. The absorption isotherms are obtained by maintaining constant the volume of the sample and the quantity of hydrocarbons and by varying the quantity of carbon from 0.1 to 5.0 g/liter. After agitating the samples to evenly distribute the hydrocarbons, the samples are filtered under pressure and the first fraction is discarded while the remainder of the sample is used for the determination of hydrocarbon residue; this is achieved with a method based on chromatography on a thin 'canalized' film. Both carbons used (Pittsburg and Westvaco) can reduce hydrocarbon content to less than one mg/liter after 2 hours. A pilot plant, using Pittsburg carbon in 12 X 40 granular form, reduced the total hydrogen content per gram of carbon to a value x/Q (x: quantity of hydrocarbons, Q: weight of the carbon) of 0.169 grams. After 153 hours of functioning, the anaerobic decomposition of the hydrocarbons was noted in all three columns; this was totally eliminated by passing through the columns 100 ml 5% HCl for three minutes. The passage of vapor through the columns for 16 hours leads to a 10% recovery of the hydrocarbons, with a regeneration efficiency of 75%. (Waltner-FIRL)
W76-07758

REFINERY WASTEWATER TREATMENT AND REUSE,
Frantz Co., Houston, Tex.
K. E. Bush.
Chemical Engineering, Vol. 83, No. 8, p 113-118, April 12, 1976. 2 fig, 24 ref.

Descriptors: *Oil wastes, *Waste water treatment, *Industrial wastes, Design criteria, Activated sludge, Trickling filters, Tertiary treatment, Lagoons, Activated carbon, Adsorption, Oxidation, Reviews, *Water reuse, Organic compounds.
Identifiers: Refinery wastes.

The process engineer must keep familiar with changing regulations and technology. A review of current design processes for petroleum refinery waste water treatment is presented. Unit processes are categorized as primary, intermediate, or secondary/tertiary. The choice of one or more of these stages depends upon the quality of the raw effluent and the required pollutant reduction. The procedures detailed include sulfide/ammonia stripping, oil removal, pH control, dissolved air flotation, activated sludge, trickling filters, waste stabilization ponds, aerated lagoons, filtration, carbon adsorption, and chemical oxidation. (Kramer-FIRL)
W76-07759

WATER REUSE AND RECYCLE IN THE CDEHDED BLEACH SEQUENCE,
CIP Research Ltd., Hawkesbury (Ontario).
J. A. Histed, and F. M. A. Nicolle.
Tappi, Vol. 59, No. 3, p 75-77, March, 1976. 3 fig, 6 tab, 5 ref.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Water reuse, *Recycling, Industrial wastes.
Identifiers: Kraft mill bleacheries.

Water reuse and recycling in the kraft mill bleachery has been investigated. In kraft mill bleacheries, the normally low temperature associated with the hypochlorite stage of the CDEHDED bleach sequence has created an obsta-

cle to direct countercurrent washing. Laboratory simulation demonstrated that the hypochlorite stage can be operated at 80 C in a tight countercurrent washing system with no adverse effects on the properties of fully bleached pulp. Extensive chlorination filtrate recycling is practiced, thus reducing the volume of effluent from the chlorination sewer to 491 U.S. gal/airdry ton of bleached pulp (adbt). Total effluent from the EHDED stages could be reduced to 976 U.S. gal/adbt using the tight countercurrent washing system. (Kramer-FIRL)
W76-07760

COKING OF WASTE KRAFT PULPING LIQUORS AT LOWERED PH,
Texaco, Inc., New York. (Assignee).
H. V. Hess, E. L. Cole, and W. F. Franz.
United States Patent 3,944, 462. Issued March 16, 1976. Official Gazette of the United States Patent Office, Vol. 944, No. 3, p 1356, March, 1976. 1 fig.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Patents, *Industrial wastes, Incineration, Adsorption, Burning, Hydrogen ion concentration.
Identifiers: *Coking, Kraft pulping liquors.

A patent has been issued for a process to treat alkaline kraft pulp liquors at a lowered pH. In an adsorbing zone, extraneous S02 is added to the kraft liquors, lowering the pH by at least one unit. The liquors are then coked in the liquid phase without air by heating them to a temperature between 450 and 700 F, at a pressure from 1000 to 3000 psig for 0.5 minutes to 6 hours, thereby forming coke. The gases formed, which include H2S and an aqueous effluent, are treated so that the coke is separated from the effluent. The coke is burned to produce sulfur dioxide. Lime and H2S are added to the effluent in a second absorbing zone to form new kraft cooking liquor. (Kramer-FIRL).
W76-07761

PROCESS CONTROL METHOD FOR THE CHEMICAL PURIFICATION OF WASTE-WATERS (SPOSOB OPERATIVNOGO UPRAVLENIYA PROTSESSOM KHIMICHESKOY OCHISKKI STOCHNYKH VOD),
I. G. Alesina, M. M. Krunchak, V. P. Semenov, V. Ponizovskiy, and A. F. Milagin.
Bumazhnaya Promyshlennost, No. 1, p 22-23, 1976. 1 fig, 1 tab, 2 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Color, Mathematical studies, Biological treatment, Alkalinity, Coagulation.
Identifiers: Sulfate pulpmaking.

Functional relationships were established between the basic initial parameters of waste waters generated in sulfate pulp making, in order to develop process controls for the purification of such waste water following biological treatment. These included color and alkalinity, the dose of the coagulant (alum), and the quantity of the coagulant that can be replaced by sulfuric acid to reduce the alkalinity. Part of the coagulant is used up to acidify the waste water and create optimal conditions for coagulation, and a minimal coagulant dose was determined as a function of the color of the waste water. It was therefore possible to replace an additional quantity of coagulant by acid. The mathematical relationships obtained make it possible to adopt process control for coagulant dosage as a function of the initial color and alkalinity of the biologically treated waste water. (Takacs-FIRL).
W76-07762

HIGH GRADIENT MAGNETIC FILTRATION OF MAGNETIC AND NON-MAGNETIC CONTAMINANTS FROM WATER,
Harvard School of Public Health, Boston, Mass. Dept. of Environment Health Sciences.
R. Mitchell, G. Bitton, and J. A. Oberteuffer.
Separation and Purification Methods, Vol. 4, No. 2, p 267-303, 1975. 14 fig, 7 tab, 37 ref.

Descriptors: *Filtration, *Separation techniques, *Waste water treatment, *Industrial waste, *Municipal wastes, Water pollution control.
Identifiers: *Magnetic filtration.

High gradient magnetic separators have been developed which are capable of efficient separation of even weakly magnetic suspended solids or precipitates for which conventional magnetic separation techniques are ineffective. Non-magnetic colloidal material in polluted water may also be removed by high gradient magnetic devices following the addition or 'seeding' of small quantities of magnetic iron oxide (magnetite). Pollutants are rapidly filtered from water, with a minimum of energy expenditure. Because magnetic forces on fine particles may be several times greater than gravitational forces, removal is more efficient than with sedimentation. An overview is presented on the removal of individual pollutants by direct and seeded high gradient magnetic filtration. These treatments are applicable to both polluted natural waters and to industrial waste waters. (Kramer-FIRL).
W76-07763

PRELIMINARY STUDY OF EXPERIMENTAL SYSTEM FOR AMMONIA REMOVAL AT SOUTH LAKE TAHOE ADVANCED WASTE-WATER TREATMENT PLANT,
R. Cuenca.
In: Proceedings: Lake Tahoe Research Seminar II, 27 September 1974, Sands Vagabond Convention Center, South Lake Tahoe, California, Report No. NSF/RA/G-74-012, p 3-21.

Descriptors: *Waste water(Pollution), *Waste water treatment, *Ammonia, *Domestic wastes, Tertiary treatment, Treatment facilities, Sprays, Pollutants, Water pollution, Nitrates, Lime, Ponds.
Identifiers: *Ammonia removal, *Lake Tahoe(Nev - Calif).

Nitrogen first enters the treatment plant in domestic wastewater in the form of ammonia and organic nitrogen compounds. Total nitrogen in domestic wastewater can vary from 20 to 55 mg/1. In the activated sludge treatment process such as that at South Lake Tahoe, these compounds are first hydrolyzed and then oxidized by microorganisms until all of the nitrogen is converted to aqueous ammonia. As the result of research conducted in South Africa and Israel, interest was stimulated in a method of ammonia removal which had never been tried at plant scale. The system is basically comprised of four components. Following chemical clarification of the lime treated wastewater, the water is transferred to a high pH detention pond. The detention time in the pond varies from 5 to 12 hrs depending on the influent flow rate. This first pond is followed by a second detention pond in series. This pond has installed a system of 46 spray nozzles. Following the ponds is a modified stripping tower. Installed in the interior of the tower is a system of 24 spray nozzles identical to those in the spray pond. The final step was breakpoint chlorination which had previously been used at South Lake Tahoe. (See also W76-07793) (Sims - ISWS)
W76-07794

ORE MINING AND DRESSING POINT SOURCES CATEGORY, INTERIM FINAL RULES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07844

ORE MINING AND DRESSING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07845

COAL MINING POINT SOURCE CATEGORY: APPLICATION OF EFFLUENT LIMITATIONS GUIDELINES FOR EXISTING SOURCES TO PRETREATMENT STANDARDS FOR INCOMPATIBLE POLLUTANTS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07847

COAL MINING POINT SOURCE CATEGORY, INTERIM FINAL RULE MAKING.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07848

MINERAL MINING AND PROCESSING POINT SOURCE CATEGORY INTERIM FINAL RULEMAKING.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07849

GRAIN MILLS POINT SOURCE CATEGORY: PROPOSED PRETREATMENT STANDARDS FOR NEW SOURCES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07850

INK FORMULATING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07851

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07852

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07854

CANNED AND PRESERVED FRUITS AND VEGETABLES PROCESSING INDUSTRY POINT SOURCE CATEGORY, INTERIM FINAL RULE MAKING,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07855

IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY PROPOSED EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07856

CANNED AND PRESERVED FRUITS AND VEGETABLES PROCESSING INDUSTRY POINT SOURCE CATEGORY PROPOSED EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07857

A NEW TIGHT FIT - INSERTION OF A PLASTIC LINER IN A 42 INCH SEWER.
For primary bibliographic entry see Field 8G.
W76-07994

LAYING 5,000 FT. OF METAL PIPE IN 24 DAYS.
For primary bibliographic entry see Field 8A.
W76-07995

POLLUTION OF THE RUNOFF IN SEPARATE SEWER SYSTEMS, AND MEASURES FOR THE REDUCTION OF RAINWATER RUNOFF-GENERATED POLLUTION OF WATER BODIES (DIE VERSCHMUTZUNG DES ABFLUSSES IM TRENNVERFAHREN SOWIE MASSNAHMEN ZUR VERMINDERUNG DER GEWAESSERVERSCHMUTZUNG INFOLGE REGENWASSEREINLEITUNGEN),
For primary bibliographic entry see Field 5B.
W76-07997

LARGEST PVC FILTER INSTALLATION.
For primary bibliographic entry see Field 8G.
W76-07998

VIRUS REMOVAL AND INACTIVATION BY PHYSICAL-CHEMICAL WASTE TREATMENT,
Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidemiology.
M. D. Sobsey, C. Wallis, M. F. Hobbs, A. C. Green, and J. L. Melnick.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 99, No. EE3, p 245-252, June, 1973. 1 fig, 3 tab, 19 ref.

Descriptors: *Waste water treatment, Viruses, Chlorination, Activated carbon, Adsorption, Flocculation, Filtration, Diatomaceous earth, *Sewage treatment.
Identifiers: *Virus removal, Comminution, Vacuum filtration, *Physico-chemical treatment, Package plants.

A prototype of a packaged sanitary waste water treatment system employing physical-chemical processes has been evaluated for its ability to remove and inactivate enteric viruses. The treatment system, consisting of comminution, chlorination, activated carbon adsorption, alum flocculation, and vacuum filtration using diatomaceous earth as a filter aid, was designed for a variety of situations where conventional biological treatment is impractical. Both simulated marine sewage and simulated river water to which vaccine strain type I poliovirus was added as a marker were used as influent waste water. The treatment system was capable of reducing the total amount of virus in the waste water from about 99.96% reduction when marine sewage was processed, and from over 99.9996% reduction when simulated river water was processed. However, about 2.6% and 0.16% of the total influent virus was detectable in filter cake solids from raw sewage and from simulated river water, respectively. The degree of virus reduction in the treatment system is superior to that obtained in conventional primary and secondary waste water treatment. (Sandoski-FIRL)
W76-07999

SEWAGE PURIFICATION SYSTEM LICENSE.
Die Siviele Ingenieur in Suid-Afrika, Vol. 15, No. 1, p 28, January, 1973. 1 fig.

Descriptors: *Sewage treatment, Activated sludge, Effluents, Nitrogen, Reclamation, Costs, Construction, Operation and maintenance, *Waste water treatment, Effluents, Africa.
Identifiers: South Africa, Orbal Sewage Purification System.

The South African Inventions Development Corporation has granted an exclusive license to Orbal Purification (Pty) for the exploitation of the Orbal Sewage Purification System in Southern Africa. The system is based on the principles of the activated sludge process and produces a well-stabilized sludge as well as a high-purity effluent. Owing to the exceptionally low nitrogen content, the effluent is suitable for reclamation. The cost of sewage treatment using the Orbal System is lower than that of conventional systems, due partly to inexpensive construction and maintenance and simplicity of operation. (Sandoski-FIRL)
W76-08000

4000-FOOT OUTFALL HAS 640-FOOT DIFFUSER FOR OCEAN DISPERSAL.
For primary bibliographic entry see Field 5E.
W76-08002

THE APPLICATION OF PURE OXYGEN FOR WASTE WATER PURIFICATION WITH ACTIVATED SLUDGE (DIE ANWENDUNG VON REINEM SAUERSTOFF BEI DER ABWASSERREINIGUNG MIT BELEBTEM SCHLAMM),
K. Scherb.
Muechner Beitraege zur Abwasser-, Fischerei-und Flussbiologie, Vol. 22, p 109-124, 1973. 7 fig, 2 tab, 24 ref.

Descriptors: *Waste water treatment, *Oxygen, Aerobic bacteria, Activated sludge, Carbon dioxide, Biochemical oxygen demand, Chemical oxygen demand, Sludge, Aerobic treatment, *Oxygenation.
Identifiers: *UNOX, Sludge concentration, High purity oxygen.

A new treatment method using oxygen instead of air for the supply of aerobic bacteria in the activated sludge process is entitled UNOX. The UNOX oxygen entry system, requires a series of inter-connected gas-tight chambers closed on top and an even distribution of activated sludge over the chambers to achieve a 90 percent use of the oxygen. Oxygen is supplied to the first low pressure chamber, drawn on by means of compressors installed on top of the chambers, and transported into the sludge through a hollow agitator axle. Eight perforated arms are installed through which the oxygen may leave. This process is repeated in successive chambers. Each chamber has its own gas circulation maintained by the compressors. Since oxygen is constantly consumed by the water-sludge mixture and carbon dioxide is produced during the decomposition processes, the oxygen concentration drops from chamber to chamber until only 40 to 50 percent remains, with spent gas escaping to the atmosphere. Experimental plants operating with the UNOX method have been constructed in New York, Ohio, and Louisiana. In the Cincinnati plant, a BOD reduction of 91.4 and 96.1 percent was measured for residence times of 2.2 and 2.8 hours; COD dropped by 77 and 84 percent; and, sludge concentration increased to 8.8 g/liter with an oxygen concentration exceeding 6 mg/liter. (Nave-FIRL)
W76-08004

THE MAINTENANCE AND MANAGEMENT OF SEWAGE PIPE SYSTEMS (GESUIKANRO NO IJI KANRI),
Osaka Municipal Government Bureau of Sewage Works (Japan).
For primary bibliographic entry see Field 8A.
W76-08005

BIOLOGICAL SEWAGE TREATMENT INSTALLATIONS (BIOLOGISCHE ABWASSERREINIGUNGSANLAGEN).
Wasserwirtschaft-Wassertechnik, Vol. 23, No. 3, p 105, 1973.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage treatment, *Biological treatment, Automatic control, Aeration, Organic matter, Sludge.
Identifiers: Package treatment.

A compact sewage treatment installation, designed for complete biological treatment of sewage in small communities, vacation establishments, hotels, or small industrial sites, has been produced in Czechoslovakia in four sizes, with 25, 40, 65, and 93 cubic meters nominal tank volume. The easily mounted and transported system has a rectangular steel container for the frame installed on a concrete plate and is comprised of three parts: a dry intake space with a slotted drum rack, an activation space aerated through a shaft, and a settling space with a resettable overflow chute. Protected by an overhead roofed service platform, the system includes automatic control, a heater, an auxiliary transformer for portable lighting, and a 220 v transformer for electric drive equipment. In the activation space, the sewage is circulated under intensive aeration, and organic matter gradually mineralized. The sludge must be discharged periodically. (Holz-FIRL)
W76-08006

EFFICIENCY OF HEAVY METALS REMOVAL IN MUNICIPAL SEWAGE TREATMENT PLANTS,
Environmental Protection Agency, Kansas City, Mo.
H. G. Brown, C. P. Hensley, G. L. McKinney, and J. L. Robinson.
Environmental Letters, Vol. 5, No. 2, p 103-114, 1973. 2 fig, 3 tab, 9 ref.

Descriptors: *Municipal wastes, *Treatment facilities, *Waste water treatment, Heavy metals, Monitoring, Sampling, Chromium, Copper, Lead, Aeration, Sludge, *Sewage treatment.
Identifiers: *Heavy metals removal, Suspended solids removal.

During the period from January to July 1972, six municipal sewage treatment plants were monitored for the efficiency of heavy metals removal. Composite samples from several locations within each plant were analyzed for cadmium, chromium, copper, zinc, and lead. The efficiencies for the removal of each metal from each plant were studied. The results of this study show that chromium, copper, and lead were more efficiently removed in secondary treatment processes than in primary processes. Chromium is reduced during aeration in the secondary process, copper is strongly adsorbed by the microbial floc, and lead is removed more efficiently because of increased settling time and larger particle size in secondary treatment. Zinc was removed equally well from all plant types. Removal correlations for cadmium could not be made. The results from the six plants in this study indicate that a definite advantage of a secondary treatment plant over a primary treatment plant in heavy metals removal is the increased suspended solids (SS) removal. This increased SS removal results in an exponentially increased heavy metals removal. (Sandoski-FIRL)
W76-08008

POLLUTION OF WATER BODIES BY ARTIFICIAL RUNOFF OF RAINWATER POLLUTION BY WASTE WATER OF MIXED SEWERS (BELASTUNG DER GEWAESSER DURCH KUENSTLICHE ABLEITUNG VON NIEDERSCHLAEGEN. BELASTUNG DURCH ABWAESSER DER MISCHKANALISATION),
For primary bibliographic entry see Field 5B.
W76-08009

PREFAB CASTING SYSTEM PACES SEWER JOB THROUGH WET SITE,
McGraw-Hill World News, Vienna (Austria).
For primary bibliographic entry see Field 8A.
W76-08012

ROTATING SCREEN SEPARATOR,
Sweco, Inc., Los Angeles, Calif. (Assignee).
P. H. Mook.
United States Patent 3,743,094. Issued July 3, 1973. Official Gazette of the United States Patent Office, Vol. 912, No. 1, p 151-152, July 3, 1973.

Descriptors: *Screens, *Combined sewers, Sewerage, Flow rates, Effluents, *Patents, Overflow, *Waste water treatment, Sewage treatment, Cleaning, *Separation techniques.
Identifiers: *Rotating screen separators.

Equipment and methods for screening and concentrating waste water overflow from combined sewer systems are disclosed. Exemplary equipment includes a separator employing a substantially cylindrical rotating screen. Influent is piped upwardly into the equipment and deflected outwardly toward the inner surface of the screen in a manner to achieve a desired flow rate and flow pattern of the influent onto the screen. Means are provided for controlling the flow rate and for suitably directing the influent in a plurality of substantially discrete inclined streams toward the inner surface of the rotating screen. The screen is rotated at a speed to achieve a desired centrifugal force. Effluent passes through the screen to an outlet and the remaining concentrate passes to an outlet. A certain amount of the influent splashes from the inner surface of the screen, and is received by a backsplash pan and may be recirculated and rescreened. The screen is in the form of a screen cage having a plurality of removable screen panels for facilitating replacement of damaged screens or changing of screen type or mesh size. Cleaning means is provided for directing a cleaning fluid periodically at the screen. (Sandoski-FIRL)
W76-08016

DEVICE FOR SEPARATING SOLIDS AND OTHER FOREIGN BODIES FROM LIQUIDS IN A PIPE CONDUIT,
Siemens A. G., Munich (West Germany).
K. Ruthrof.
United States Patent 3,747,771. Issued July 24, 1973. Official Gazette of the United States Patent Office, Vol. 912, No. 4, p 1409, July 24, 1973.

Descriptors: *Conduits, *Screens, Flow, *Patents, *Separation techniques, Equipment, *Waste water treatment.
Identifiers: Separated solids.

A patented device for separating solids and other foreign bodies from liquids in a pipe conduit includes a screen mounted in the conduit which is conically tapered in the flow direction. A discharge tube for the separated solids, leading to the outside, is connected at the apex of the screen. A barrier is arranged on the outer side of the screen which extends perpendicularly to the surface of the screen between the individual rows of holes of the screen. (Sandoski-FIRL)
W76-08017

ULTRASONICS IN THE SEWAGE INDUSTRY,
Municipality of Metropolitan Seattle, Wash.
J. Wolff.
Water and Sewage Works, Vol. 120, No. 5, p 84-85, June, 1973. 2 fig.

Descriptors: *Waste water treatment, *Instrumentation, *Ultrasonics, Monitoring, Treatment facilities, Interceptor sewers, Pollutant identification, Cities, Washington.
Identifiers: Seattle(Wash), Sensors.

The Municipality of Metropolitan Seattle (Metro) which has the responsibility for wholesale collection and treatment of storm water and sanitary sewage in the Seattle metropolitan drainage basin, is pioneering the use of ultrasonics for level measurement and control in the sewage industry. Ultrasonic level measuring systems, designed and manufactured by Western Marine Electronics (Wesmar) of Seattle, have been installed in two of Metro's six treatment plants, at the north trunk interceptor and in a pumping station. The level monitor is a non-contacting continuous measuring system. Each system is comprised of two basic components, a sensor and a solid-state electronics unit interconnected by coaxial cable, capable of operating at distances up to 500 feet apart. The sensor, mounted above the material to be measured, is a combination sonic transmitter-receiver. It emits an ultrasonic signal onto the target and the echo is reflected and detected by the same sensor. The signal is then transmitted through the coaxial cable to the electronics unit, where the time interval between transmission and reception is computed. This time computation is converted to a continuous electrical output which is in turn displayed on a meter in engineering units or fed to process control equipment or recorders. (Sandoski-FIRL)
W76-08018

OXYGEN MEASUREMENT IN ACTIVATION BASINS WITH THE ZUELLIG-02-PROBE,
For primary bibliographic entry see Field 5A.
W76-08019

SEDIMENTATION TECHNOLOGY IN DEVELOPMENT (SEDIMENTATION-TEKNIK UNDER UTVECKLING),
J. Hjort.
Kemisk Tidskrift, Vol. 85, No. 5, p 46-48, May, 1973. 2 fig.

Descriptors: *Sedimentation, *Sludge treatment, Flocculation, Settling basins, Valves, Pumping, Drainage, *Waste water treatment.
Identifiers: Sedimentation technology, Sweden.

The Lovoe-type flocculation and sedimentation basin in Sweden has been improved by incorporating the following changes. Sludge drainage through bottom valves, which requires a long time and provides sludge with a low dry content, has been replaced by perforated tubes mounted on wheels which are moved back and forth, over and underneath the intermediate bottom in a flow direction for sludge suction. Sludges with a dry content of two to three percent can be tapped gravitationally, while sludge with higher dry content need pumping. Sludge tapping, its frequency and duration are chosen as a function of the dry matter content in the sludge. The bacteria count in decantates from sedimentation basins with this sludge drainage system did not differ from that in decantates from conventional basins. No chlorination is applied in the flocculation and settling stages. (Tacaks-FIRL)
W76-08020

BOCA RATON'S NEW WASTEWATER TREATMENT PLANT,
V. W. Longworthy.
Water and Sewage Works, Vol. 120, No. 5, p 65, June, 1973. 3 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Activated sludge, Aeration, Chlorination, Sludge, Sludge disposal, Landfills, Atlantic Ocean, Florida.
Identifiers: Boca Raton(Fla), Aerobic digestion, Vacuum filtration.

Black, Crow and Eidsness has designed an activated sludge process at Boca Raton, Florida's new 10 mgd waste water treatment plant which can be operated as a contact stabilization or a completely mixed system. The sequence is aeration-final settling-chlorination, with aerobic digestion of sewage solids. The resulting sludge is decanted, then concentrated to ten percent solids in a basket-type centrifuge. Thickened sludge is trucked to a sanitary landfill. Sludge from the city's adjacent water softening plant is vacuum filtered at the waste water treatment plant. The cake, containing 65 percent solids is trucked off the site and used as a road building base. Treated effluent is chlorinated at the plant and rechlorinated three miles away at the Atlantic Ocean beach before discharge (one mile from shore in 90 feet of water through a 36-inch diameter cast iron outfall). (Sandoski-FIRL)
W76-08021

A SURVEY OF CHIBA MUNICIPAL CENTRAL SEWAGE TREATMENT PLANT (CHIBA-SHI CHUO GESUI SHORIJO NO GAIYO),
Chiba Municipal Government, (Japan). Bureau of Construction.
T. Suzuki, and T. Kamiharu.
Gesuido Kyokai-shi, (Journal of Japan Sewage Works Association), Vol. 10, No. 109, p 53-62, June, 1973. 3 fig. 2 tab.

Descriptors: *Treatment facilities, *Waste water treatment, Waste water disposal, Sewage effluents, Activated sludge, *Sludge treatment, Digestion tanks, Aeration, Suspended solids, Chlorine, Oceans, Dehydration, Incineration.
Identifiers: Chiba Municipal Sewage Treatment Plant, Settling tanks, Japan.

The Chiba Municipal Sewage Treatment Plants comprise three major districts serving a combined population of 1,275,000. The Central Treatment Plant construction was started in 1965 and the entire plan is being completed in three stages. Presently in the final stage, the installation of a sludge treatment system is under construction. The treatment capacity is planned for 110,760 cu m/day, but presently treats only 71,140 cubic meters in dry weather and 83,400 during rainfall. The effluent has a BOD of 200 mg/liter and suspended solids of 300 mg/liter with removal percentages of 92.5 and 89.0, respectively. The sewage effluent enters the receiving pond, where the pressure distributes the water into three settling ponds. The settled sludge is sent to the sludge relaying system and goes to the sludge concentration tank and to the digestion tank; the exhaust gas is sent to the gas tank and is used as a boiler fuel. The sludge is finally washed, dehydrated, and incinerated. The supernatant water from the first settling tanks goes to the aeration tank where the high pressure air from the blower helps oxidize organic matter and water quality is stabilized. The final settling tank settles the activated sludge mixed in the aeration tank and returns the sludge to the aeration tank. Chlorine is added for disinfection. Treatment water is cycled to the water tank or discharged to the ocean. (Seigle-FIRL)
W76-08022

PROCESS 100% EFFECTIVE.
Water and Wastes Engineering, Vol. 10, No. 7, p 22, July, 1973.

Descriptors: *Waste water treatment, *Ozone, *Laboratory tests, Catalysts, Taste, Odor, Tertiary treatment, Irradiation, Ultrasonics.
Identifiers: *Sonocatalysis, Ultrasonic irradiation.

A two-hour laboratory test has shown that a simple process involving a metal catalyst, ozone injection, and ultrasonics, can remove 42% of organic carbon materials left in waste water after it has already gone through the primary and secondary treatment stages. These results came from using a standard catalyst called Raney-Nickel, in combination with ozone and ultrasonic irradiation from a high frequency generator, which produces better oxidation reactions. The method, called sonocatalysis, can be used as a third stage polish-

ing operation to clean up waste water at a theoretical level of total purity. This process does a much better job than traditional third stage methods without the necessity of adding chlorine which can react with remaining trace impurities to produce unpleasant tastes and odors. (Sandoski-FIRL)
W76-08023

WASTEWATER TREATMENT SYSTEM USES CALCINER.
Rock Products, Vol. 76, No. 7, p 62, 85-86, July, 1973. 3 fig.

Descriptors: *Waste water treatment, *Municipal wastes, *Heat treatment, *Lime, Filters, Activated carbon, Chlorination, *Recycling, Neutralization, *Water reuse, Suspended solids, Adsorption.
Identifiers: *Z-M Process, Physico-chemical treatment, Multiple-hearth furnace.

The multiple-hearth furnace plays a key role in a municipal waste water treatment system developed by the Envirotech Corporation. Lime is regenerated in the furnace from the hydroxides and carbonates formed in lime and soda ash treatment of raw waste water. The recalcined lime is returned to the influent, and carbon dioxide evolved in the furnace is used in a neutralization step. Designated the Z-M Process, the new method utilizes chemical and physical techniques to provide reusable water without biological treatment. There are three distinct operating zones. The upper hearths form the drying and preheat zone where most free moisture is evaporated. The middle combustion zone is where the material is processed. The lower section of the furnace is the cooling zone where material is cooled prior to discharge. Overflow from the second-stage reactor-clarifier then passes through granular media filters to capture suspended solids which remain after lime treatment and recarbonation. The neutralized waste water then flows through a carbon adsorber. Small molecules are adsorbed on the surface of the granular activated carbon. After chlorination, the resulting product water may be used for recycle or discharged in compliance with local standards. The activated carbon is regenerated for recycle in a multiple-hearth furnace. (Sandoski-FIRL)
W76-08024

SEWER ALARM SYSTEM SAVES TAXPAYERS' DOLLARS,
Milford Dept. of Public Works, Conn.
A. Benedosso.
Public Works, Vol. 104, No. 9, p 113-114, September, 1973. 3 fig.

Descriptors: *Sewerage, *Treatment facilities, Costs, Sewers, Pumping, Monitoring, Connecticut.
Identifiers: Milford(Conn), Alarm systems, Lift stations.

Milford, Connecticut, has approximately 80 miles of sewer lines which require 13 lift stations to pump sewage over various crests so that gravity flow can then carry it to one of the four treatment plants in the city. Concern over malfunctions or failures at the lift stations encouraged the townspeople to purchase and install an alarm system which provides for fire, flooding, and sludge-caused high water warnings for each plant. The alarm system was purchased piecemeal and installed by local electricians, with minor modifications to meet the needs of the sewage treatment facilities. The entire project, including labor, materials, and consulting fees cost $15,000. Among the advantages of the system are reduced costs by use of public utility lines, major purchase of standard equipment which provides savings over leasing, and the ability of local electricians to repair and maintain the equipment. Also, constant visual surveillance of the entire sewer system is maintained with the ability to expand the status board and alarm system when the sewer system is extended. (Sandoski-FIRL)
W76-08030

'SATELLITE PLANTS' - SPECIAL TREATMENT FACILITIES.
Water and Wastes Engineering, Vol. 10, No. 8, p 9, August, 1973.

Descriptors: *Treatment facilities, *Combined sewers, *Separated sewers, *Waste water treatment, Storm runoff, Capital costs, Operating costs, Sewers, Storm drains, Overflow, Wisconsin.
Identifiers: Racine(Wis).

Special treatment facilities being tested in Racine, Wisconsin, and which are located at points where discharge into a river or stream occurs, may be an alternative to the costly and inconvenient process of separating combined storm and sanitary sewers. At a cost of $2 million, the new facility has relatively lower capital costs and higher operating costs than Racine's main dry weather waste water treatment plant, since 'satellite plants' operate only about one percent of the time, when overflow conditions take place. The system has a total capacity of 60 mgd and serves over 450 acres of combined sewers. The site chosen for the demonstration project receives discharge from the two largest relief points in the city's interceptor system. Estimates for the cost of separating combined storm and sanitary sewers would run between $10 and $13 million and the separation still would not treat the surface pollution. (Sandoski-FIRL)
W76-08031

SEWAGE PLANT USES NATURAL FEATURES TO CUT COSTS.
Engineering News-Record, Vol. 191, No. 10, p 14, August 30, 1973. 1 fig.

Descriptors: *Municipal wastes, *Treatment facilities, *Waste water treatment, Tertiary treatment, Soil properties, Topography, *Sewage treatment, Soil types, Adsorption, Septic tanks, Lagoons, Aeration, Oxidation, Waste water disposal, Costs.

The result of a $6000 study on municipal waste control was a concept that uses the existing topography and the soil characteristics of the area to provide advanced treatment at a fraction of the cost of standard primary-secondary-tertiary sewage treatment methods. In cleanup terms, this means a 99 percent purification of the St. Donat, Quebec, sewage. Key to the successful implementation of this treatment method is the type and absorption of the soil, which is predominantly sand and gravel. Once the plant is completed, primary treatment will be provided by an existing, but modified, septic tank located above the bay. Settled sewage then passes into the mechanically aerated first lagoon which reduces the pollution load by oxidizing organic matter. The oxidized liquid is pumped to a sprinkler system installed on the peninsula where the existing vegetation and top soil absorbs the greatest part of the oganic matter and nutrients. From the peninsula, the water filters through 5 to 35 feet of sandy sub-soil, and flows into the second 60-acre lagoon for polishing before emptying into the Ouareau River. (Sandoski-FIRL)
W76-08033

TWO-STAGE BIOLOGICAL TREATMENT OF A DIFFICULT WASTEWATER MIXTURE,
Carollo (John) Engineers, Walnut Creek, Calif.
G. W. Knopf.
Public Works, Vol. 104, No. 8, p 89-92, August, 1973. 1 fig, 2 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Biological treatment, Domestic wastes, Industrial wastes, Activated sludge, Filters, Aeration, Sewers, Toxicity, California.
Identifiers: Clarifiers, Plastic media roughing filter.

San Pablo Sanitary District's (California) new $4.4 million treatment plant expansion is providing reliable and efficient treatment for a difficult-to-treat mixture of domestic and industrial waste water. The main reason for the success of the new plant additions is a two-stage biological treatment plant incorporating the use of a roughing filter prior to conventional activated sludge treatment. The basic concept of this type of treatment plant was to protect the activated sludge portion of the plant from toxic shock loads. This was accomplished by the use of a plastic media roughing filter located between the primary clarifiers and the aeration basins. The performance of this plant has proven the concept to be an effective means of protecting the bio-mass in the aerator. On several occasions since plant start-up, toxic materials discharged to the sewer have stripped the bio-mass from the filter; however, the activated sludge was unaffected due to protection provided by the roughing filter. The plant is to be developed in two phases. Initially, the facility is to provide for an average wet weather flow of 16.5 mgd. Phase 2 additions will raise the average wet weather treatment capacity to 24.5 mgd. (Sandoski-FIRL)
W76-08034

APPLICATION OF SYSTEM ANALYSIS IN TWO-STAGE REVERSE OSMOSIS PROCESS DESIGN FOR WATER DESALINATION,
National Research Council of Canada, Ottawa, Division of Chemistry.
For primary bibliographic entry see Field 3A.
W76-08076

5E. Ultimate Disposal Of Wastes

DISPOSAL OF LIQUID WASTES BY CHEMICAL FIXATION,
J. R. Conner.
Waste Age, Vol. 5, No. 6, p 26-27, 30, 33, 35-38, 42, 44-45, September, 1974. 10 fig, 11 tab, 7 ref.

Descriptors: *Liquid wastes, *Ultimate disposal, Leachates, Industrial wastes, Chemical wastes, Waste disposal, Land reclamation.
Identifiers: *Chemical fixation, *Chemfix process, Cost-effectiveness.

New approaches to dealing with the ultimate disposal of industrial wastes involve chemical fixation and solidification. A number of chemical systems react with various wastes to form solids which encapsulate, immobilize or otherwise tie up the waste. These may be organic processes such as asphalt tar, polyolefins, and epoxies, or they may be inorganic processes such as Portland cement, lime-based mortars, and lime-pozzolan cements. About five years ago, the Chemfix process was developed for the chemical fixation and solidification of complex waste mixtures; it produces a nontoxic environmentally-safe material that can be used as landfill. The Chemfix process, now patented is a two-part, inorganic system which reacts with all polyvalent metal ions and certain other waste components and which also reacts within itself to form a chemically and mechanically stable solid. The system is based on the reactions between soluble silicates and silicate setting agents which form a solid matrix. (Orr-FIRL)
W76-07500

RECENT INVESTIGATIONS INTO THE DISPOSAL OF TANNERY WASTE WATER,
Instituut TNO voor Leder en Schoenen, Waalwijk (Netherlands).
For primary bibliographic entry see Field 5D.
W76-07506

INCINERATION GIVES NEAT ANSWER TO PHARMACEUTICAL WASTES DISPOSAL PROBLEMS.
Process Engineering, p 68-69, April, 1974. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Waste disposal, *Incineration, Chemical wastes, Fuel, Ultimate disposal, Waste water disposal.
Identifiers: Heat recovery, *Pharmaceutical wastes.

An incineration and heat recovery process was designed to work economically. This waste disposal system was installed for a British pharmaceutical and chemical company which produces over 60 tons/day of aqueous wastes. The wastes are lean in caloric value and contain about 80 to 90% water. Fuel is saved when liquid feed from the plant is fed into a concentrating unit which is split into two phases, water vapor and organics, with a smaller liquid phase containing phosphoric acid. This unit is fired by fuel oil. A conventional John Zink ZTO incinerator then burns the liquid phase, using considerably less fuel oil because of the reduced water content. The gases from the incinerator are cooled and scrubbed to remove inorganic compounds. They are then routed to a packed bed unit to remove hydrochloric acid. With this system, about 10 million Btu/hr (40% of the heat input) is recovered in the waste heat boiler as 10,000 lb/hr of 150-psi steam. The process equipment costs are only 30% greater than a conventional incinerator. As fuel oil prices increase, this type of waste disposal system should become increasingly profitable. (Murphy-FIRL)
W76-07529

TREATMENT AND DISPOSAL OF WASTEWATER FROM ONION DEHYDRATION FACTORY AT SATPUR, NASIK,
Maharashtra Engineering Research Institute, Nasik (India).
For primary bibliographic entry see Field 5D.
W76-07533

REVERSE-OSMOSIS SYSTEM FACILITATES DISPOSAL OF USED CUTTING OILS.
For primary bibliographic entry see Field 5D.
W76-07628

TREATMENT OF EFFLUENTS,
For primary bibliographic entry see Field 5D.
W76-07650

THE CONSTRUCTION OF AN INDUSTRIAL WASTE WATER DISCHARGE PIPE SYSTEM INTO THE SEA (BAU EINER INDUSTRIEABWASSER-LEITUNG INS MEER),
G. Brux.
Baumaschine und Bautechnik, Vol. 20, No. 11, p 447-448, November, 1973. 7 fig, 5 ref.

Descriptors: *Waste water disposal, *Industrial wastes, *Pipelines, Plastic pipes, Chemical industry, Concrete, Construction materials, Waste disposal, Waste water treatment.
Identifiers: Waste discharge pipes.

The construction of a pipe system, designed to discharge waste waters from a chemical plant in France into the sea, is described. The submerged section of the pipe system, more than 300 meters in length, is composed of a polyethylene pipe with a 1,200 mm outside diameter, connected to the ground pipe of 800 mm diameter. A nylon fabric hose, placed inside the polyethylene pipe, was filled with colloidal concrete mortar by injection through a narrow passage that served as a ballast. This reduced the inside diameter of the underwater pipe section to that of the land section to facilitate construction. (Takacs-FIRL)
W76-07658

EFFECT OF TEMPERATURE ON CANNERY WASTE OXIDATION,
North Texas State Univ., Denton. Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-07662

SLUDGE INCINERATION AND PRECIPITANT RECOVERY, VOLUME I, A SELECTIVE CODED BIBLIOGRAPHY,
Department of the Environment, Ottawa (Ontario).
D. Plummer.
Research Report No. 31, Training and Technology Transfer Division (Water), Environmental Protection Services, Environment Canada, Ottawa, Canada, February 1976, 31 p., 193 ref., 11 tab. 72-3-4.

Descriptors: *Sewage, *Sludge, *Sewage disposal, Incineration, Iron, Lime, Dewatering, Effluents, Bibliographies, Publications, Water pollution control, Waste treatment.
Identifiers: *Precipant recovery, Alum, Sludge conditioning.

Incineration has been a popular method of ultimate disposal of sewage sludges for many years. With the recent implementation of chemical phosphorus removal programs at municipal wastewater treatment plants, interest has developed in the recovery and recycle of the chemical precipitants (alum, iron, and lime) from incinerated sludge ash. The Wastewater Technology Centre of the Environmental Protection Service initiated a 'Sludge Incineration and Precipitant Recovery Program' in 1972. An extensive review of the related significant English language literature from the period 1968 to 1974 was performed as part of this program and is summarized in this bibliography. (Environment Canada)
W76-07678

SOME COMMENTS ON PROBLEMS OF WASTE DISPOSAL IN THE METAL FINISHING INDUSTRY.
Transactions of the Institute of Metal Finishing, Vol. 53, No. 4, p 197-200, 1975.

Descriptors: *Metals, *Waste disposal, Waste water treatment, Dyes, Sludge, Industrial wastes, Dewatering, Water pollution control, Legislation.
Identifiers: *Metal finishing industry wastes.

General waste disposal problems in the metal finishing industry in Great Britain are discussed. Typical wastes requiring special disposal are the spent or contaminated process solutions and the sludges formed either during process operations or in the course of effluent treatment. Recovery of valuable metals from process solutions or sludges which contain large quantities of one metal should be considered. Such solutions include static rinses, contaminated plating solutions, pickling solutions for metals other than ferrous metals or aluminum, strippers for nickel, copper, cadmium and precious metals, and etches for copper. Costs of operating a recovery process must be compared with related savings in disposal costs. In cases where toxic and corrosive wastes are disposed of rather than recycled, new legislation such as the Deposit of Poisonous Wastes Act of 1972 governs their collection, removal, and deposit. Under this Act, wastes must be declared and analyzed; following completion of removal and deposit, local authorities must again be notified. Disposal costs include waste disposal site charges and transportation costs, and varying according to the nature of the waste and the distance of transport. Wastes of low toxicity are discharged into unused quarries, sand or clay pits, while such wastes as pickle acids and spoiled chrome solutions may be discharged only to controlled sites, where they will not degrade the quality of ground or surface waters. (Kramer-FIRL)
W76-07754

NEBRASKA DISPOSAL WELLS REGULATIONS.
Nebraska State Dept. of Environmental Control, Lincoln.
For primary bibliographic entry see Field 5G.
W76-07801

REGISTRATION OF LIQUID WASTE HAULERS AND WASTE DISPOSAL TO LAND,
For primary bibliographic entry see Field 5G.
W76-07802

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION CONCENTRATED ANIMAL FEEDING OPERATIONS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07846

OCEAN DUMPING.
For primary bibliographic entry see Field 6E.
W76-07860

4000-FOOT OUTFALL HAS 640-FOOT DIFFUSER FOR OCEAN DISPERSAL.
The American City, Vol. 88, No. 6, p 96, June, 1973. 1 fig.

Descriptors: *Outfall sewers, *Treatment facilities, *Sewage disposal, Construction, Pipes, Linings, Coatings, Atlantic Ocean, Waste water treatment, Sewage treatment, Construction materials, Joints(Connections), Concrete pipes, Diffusion
Identifiers: Monmouth County(NJ), *Ocean disposal.

Monmouth County, New Jersey, is sending its sewage 4000 feet into the Atlantic Ocean to a 640-foot long submerged diffuser. The new underwater outfall will tie more than a dozen communities, three sewer districts, and three treatment plants into the Monmouth County Bayshore Outfall Authority system. The outfall, 5360 feet long, is being constructed of steel pipe provided by Bethlehem Steel Corporation for the river section, the 48-inch pipe is lined and coated with coal tar enamel and double felt wrapped. For the ocean section, the pipe is lined and coated with two coats of epoxy. A concrete coating is sprayed on the outside to facilitate sinking the pipe into position. Assembled on a specially designed rubber-wheeled conveyor track, the pipe lengths are welded into 600-foot sections. Joints are bell and spigot double lap-welded. (Sandoski-FIRL)
W76-08002

BOCA RATON'S NEW WASTEWATER TREATMENT PLANT,
For primary bibliographic entry see Field 5D.
W76-08021

A SURVEY OF CHIBA MUNICIPAL CENTRAL SEWAGE TREATMENT PLANT (CHIBA-SHI CHUO GESUI SHORIJO NO GAIYO),
Chiba Municipal Government, (Japan). Bureau of Construction.
For primary bibliographic entry see Field 5D.
W76-08022

EVALUATION OF GROUND-WATER CONTAMINATION FROM CLEANING EXPLOSIVE-PROJECTILE CASINGS AT THE BANGOR ANNEX, KITSAP COUNTY, WASHINGTON, PHASE II,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 5B.
W76-08048

5F. Water Treatment and Quality Alteration

OZONE IN DRINKING WATER PREPARATION (OZON IN DER WASSERAUFBEREITUNG),
G. E. Kurzmann.
Chemische Industrie, Vol. 26, No. 8, p 502-503, August, 1974.

Descriptors: *Ozone, *Oxidation, *Water treatment, *Potable water, Viruses, Disinfection, Metals, Phenols, Chemical industry, Food processing industry.

The uses and efficiency of ozone in water purification and sterilization are surveyed. Ozone is used mainly for the destruction of pathogenic germs and for the inactivation of viruses in springwater, groundwater and surface water for drinking-water preparation. The rate of sterilization can be increased, and the specific ozone consumption can be reduced by the combination of this oxidant with polyphosphates. Rapid and highly efficient oxidation of lead, iron, cadmium, manganese, and mercury ions is possible by ozonization. Carcinogenic polycyclic aromatic hydrocarbons, present in surface waters in concentrations of 10-100 microgram per cu m, and in concentrations of 1-10 microgram per cu m in groundwater, are destroyed by ozone at efficiencies reaching up to 99.8%. The ozone oxidation products of pesticide residues in water are, however, not necessarily less toxic than the original compounds. Cyanogen and phenol are destroyed by ozone in waste water. Ozonization as a purification process can be employed for the sterilization of purified waste water, and in water preparation for bottling and pharmaceutical plants, and in oyster and shellfish beds. (Takacs-FIRL)
W76-07501

TERRITORY, INDUSTRIAL PLANTS, WATER SUPPLY, AND WASTE WATER PLANTS--PARTNERS IN JOINT INVESTMENTS (TERRITORIUM, INDUSTRIEBETRIEB UND VEB WAB--PARTNER GEMEINSAMER INVESTITIONEN),
For primary bibliographic entry see Field 5D.
W76-07669

INVENTORY OF CANADIAN COMMERCIAL SHIPS ON THE GREAT LAKES.
For primary bibliographic entry see Field 5D.
W76-07682

SELECTED BIBLIOGRAPHY ON OZONE DISINFECTION,
Canada Centre for Inland Waters, Burlington (Ontario); and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5D.
W76-07683

AN OUTBREAK OF SHIGELLA SONNEI GASTROENTERITIS ON COLORADO RIVER RAFT TRIPS,
Center for Disease Control, Atlanta, Ga.
For primary bibliographic entry see Field 5C.
W76-07691

DYNAMICS OF THE PURIFICATION OF DOMESTIC FECAL SEWAGE ON SEWAGE FARMS, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny, Vilnius (USSR).
For primary bibliographic entry see Field 5D.
W76-07692

THE WATER SUPPLY OF ROME,
College of Physicians of Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W76-07819

RUBBER ROOF PROTECTS WATER FROM POLLUTANTS.
The American City, Vol. 88, No. 6, p 33, June, 1973. 2 fig.

Descriptors: *Reservoirs, *Rehabilitation, Water treatment, Plastics, Chemicals, Construction materials, Chlorination, Water pollution control, Tennessee.
Identifiers: Chlorine depletion, Bacterial contamination, Reservoir covers, Hypalon.

Along with rehabilitation of Alcoa, Tennessee's two 50-year old hilltop reservoirs, the city had covers installed to check loss by evaporation, reduce chlorine depletion due to sunlight, and cut the potential for pollution. The covers, manufactured by Burke Rubber Company, San Jose, California, consisted of a 5-ply, 45-mil sandwhich of Hypalon, a product of Du Pont, Incorporated, and nylon reinforcing fabric. This synthetic rubber/nylon sandwhich is resistant to sunlight and weathering, mold, mildew, and fungus. Of particular importance in this application, the cover is resistant to chemicals required for water treatment. For installation, the rubber sheets arrive at the site in accordion-folded rolls packed on pallets. The rolls are positioned in their programmed locations at the top of the reservoir slope, unrolled to the bottom, and unfolded to full width. Next, 4 x 12-inch plastic foam planks are placed into their flotation sleeves and seamed. These planks provide the cover with stabilization and flotation as well as channel rainwater runoff to the periphery. Once the cover is secured in place, a foot of water/chlorine solution as admitted to the reservoir to treat the floor of the area and the underside of the cover against bacterial contamination. When this solution is drained, the reservoir is gradually filled, and placed into service. (Sandoski-FIRL)
W76-08003

WATER FLOW BINDING. TRY RELINING,
Los Angeles Memorial Coliseum and Sports Arena, Calif.
W. H. Nicholas.
The American City, Vol. 38, No. 7, p 42, July, 1973. 2 fig.

Descriptors: *Pipelines, *Construction, Flow characteristics, Linings, Cleaning, Water distribution(Applied), Water supply.
Identifiers: Renovation, *Pipeline repair.

In-place renovation, which effectively restored the original flow characteristics and performance of 2910 feet of 42-year-old transmission and distribution pipelines, has been accomplished at the Los Angeles Coliseum. To do the job, the Coliseum Commission called in a team of seven men from the Ameron, Incorporated Pipe Lining Division of Wilmington, California. To gain access to the pipelines, nipples were cut to accept the half-inch steel cable and the cleaning and lining apparatus. The lining was installed with Ameron's 'Spunline' applicator, pressure fed to ensure uniformity of coating. Hoses through which the mortar was pumped were elevated up to 50 feet and extended as long as 350 feet from the mixing units located at ground level outside the coliseum. (Sandoski-FIRL)
W76-08013

NEW AUTOMATED SYSTEM SUCCESSFULLY HANDLES BULK CHEMICALS AT POTOMAC RIVER FILTRATION PLANT,
Water and Sewage Works, Vol. 120, No. 7, p 49, July, 1973.

Descriptors: *Automation, *Treatment facilities, Lime, Storage, Flow, *Filtration, Potomac River, *Water treatment, Equipment, Gravimetry, Maryland.
Identifiers: Activators, *Potomac River Water Filtration Plant, Alum, Chemical treatment.

Installation of vibrated bin activators eliminated a major obstacle to the successful operation of a new automated chemical storage and feeding facility at the Potomac River Water Filtration Plant of the Washington Suburban Sanitary Commission, Montgomery County, Maryland. To insure uninterrupted flow of the alum and lime, consulting engineers specified installation of a seven-inch diameter Vibra Screw bin activator on each storage bin. Material is drawn from the bins into gravimetric feeders. The bin activators are flexibly hung from the bin by rubber fitted, forged steel hangers. A flexible reinforced rubber sleeve seals the small gap between the bin and the movable bottom. An integral baffle relieves headload over the discharge outlet. Mounted on the bin activator, and riding with it, is a patented oil lubricated gyrator. The vibratory action of the Vibra Screw bin activator has completely eliminated flow stoppage. Consistent flow of lime and alum to the feeders has enabled them to maintain an accuracy of within one percent of the set rate. (Sandoski-FIRL)
W76-08015

WATER TREATMENT COMPOSITION INCLUDING SYNTHETIC WAX,
Tesco Chemicals, Inc., Atlanta, Ga. (Assignee).
J. L. Halley.
United States Patent 3,753,676. Issued August 21, 1973. Official Gazette of the United States Patent Office, Vol. 913, No. 3, p 904, August 21, 1973.

Descriptors: *Water treatment, Chlorine, Inhibitors, Plant growth regulators, Bacteria, Algal control, *Patents, *Chlorination.
Identifiers: Cyanuric acid, Fatty diamide synthetic wax.

A water treatment composition which comprises a water soluble chlorine containing compound or blend of compounds, optionally cyanuric acid, a water insoluble fatty diamide synthetic wax, and optionally a molding lubricant, is effective in inhibiting the growth of bacteria, algae, and other plant life in water when the composition is blended together and shaped into dosage unit form. The composition maintains its configuration during exposure to water and retains undesirable insolubles, while permitting the leaching of chlorine from the unit by the action of water upon the composition. (Sandoski-FIRL)
W76-08029

APPLICATION OF SYSTEM ANALYSIS IN TWO-STAGE REVERSE OSMOSIS PROCESS DESIGN FOR WATER DESALINATION,
National Research Council of Canada, Ottawa, Division of Chemistry.
For primary bibliographic entry see Field 3A.
W76-08076

PUBLIC HEALTH ASPECT OF TROPICAL WATER RESOURCES DEVELOPMENT,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-08096

5G. Water Quality Control

CLAM SURVIVAL IN CHLORINATED WATER,
Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
L. J. Tilly.
Available from the National Technical Information Service, Springfield, Va 22161, as DP-1398, $3.50 in paper copy, $2.25 in microfiche. DP-1298, January, 1976, 9 p, 2 fig. AT(07-2)-1.

Descriptors: *Clams, *Chlorine, *Chlorination, Mortality, Water pollution control, Wells.

Identifiers: *Survival, Savannah River Plant(SC).

Populations of clams had been colonizing the suction wells of circulation pumps to an extent where flow of coolant water through the pumps and heat exchangers of the Savannah River Plant production reactors was restricted. An existing chlorination method was applied to water in a suction well in which both wall- and floor-dwelling clams were found. After clams were removed from chlorine exposures (10-40ppm) of 9, 17, 25, and 54 hours, respective survivals after seven days in a recovery chamber were 97%, 84%, 47%, and 10%. Accumulated mud on the floors and walls of the basin protected large numbers of clams from lethal chlorine exposures. Of the clams thus protected, 65% were alive after seven days in the recovery chamber. (Chilton-ORNL)
W76-07481

ACID STRIP MINE LAKE RECOVERY,
Missouri Univ., Columbia. Dept. of Civil Engineering.
D. L. King, J. J. Simmler, C. S. Decker, and C. W. Ogg.
Journal Water Pollution Control Federation, Vol. 46, No. 10, p 2301-2315, October, 1974. 11 fig, 1 tab, 20 ref. OWRT A-038-MO(3).

Descriptors: *Waste water treatment, *Industrial wastes, *Acid mine water, Mining, Waste assimilative capacity, *Mine drainage, Lakes.

The recovery of acid mine drainage contaminated lakes to an alkaline condition capable of supporting entire aquatic communities at a level characterized as early eutrophy is discussed. Recovery of acid strip mine lakes is described as a natural succession resulting from gradual decreases in acid production by the spoils and leachate from unmined portions of the watershed and the leaves, grass, and other organic material in the runoff from unmined land eventually accumulating in such lakes to a concentration that is sufficient, allows sulfate reduction. Experimental studies were performed where organic matter was added to acid strip mine lake microcosms. Sawdust, wheat straw, leaves, newspaper, cattle manure and both raw and digested waste water sludge all served as suitable substrates for recovery. Green leaves produced a final state of tea-colored water with many of the characteristics of bog lake water. The other organics used produced a clear alkaline water after the recovery process was completed. The advantages of accelerating the natural process to recover acid strip mine lakes include the elevation of pH, loss of acidity and metals, and significant sulfate loss without creating a chemical sludge disposal problem. Another significant advantage is that organic wastes serve as the raw material for the process. The major disadvantage, the evolution of hydrogen sulfide to the atmosphere may be limited by controlling the amount of organic wastes added to the lake. (Orr-FIRL)
W76-07499

ACID DRAINAGE CONTROL AND WATER TREATMENT AT HEATH STEELE,
Heath Steele Mines Ltd., Newcastle, (New Brunswick).
For primary bibliographic entry see Field 5D.
W76-07512

FACTORS AFFECTING WATER QUALITY FROM STRIP-MINED SITES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-07582

FISH GROWTH RESPONSE TO MECHANICAL MIXING OF LAKE ARBUCKLE, OKLAHOMA,
Oklahoma Cooperative Fishery Unit, Stillwater.
For primary bibliographic entry see Field 5C.
W76-07587

REFERENCE GUIDE TO METHODOLOGY FOR THE ANALYSIS OF ORGANIC COMPOUNDS.
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 5A.
W76-07590

SURVEY OF IRRIGATION CANAL ECOLOGICAL PARAMETERS INFLUENCING AQUATIC WEED GROWTH,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 4A.
W76-07609

FRESHWATER BIOLOGY AND POLLUTION ECOLOGY: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Programs Operations.
For primary bibliographic entry see Field 5C.
W76-07611

INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF PARATHION.
Midwest Research Inst., Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 819, $9.25 in paper copy, $2.25 in microfiche. EPA-540/1-75-001, January 1975. 4 fig., 42 tab., 409 ref. EPA 68-01-2448

Descriptors: *Pesticides, *Evaluation, *Performance, *Reviews, Formulation, Birds, Degradation(Decomposition), Effects, Mites, Insects, Pesticide residues, Toxicity, Resistance, Hazards, Safety, Crop response, Metabolism, Costs, Animal pathology, Benefits, Human pathology, Aquatic life, Wildlife, Food chains, Lethal limit.
Identifiers: *Parathion, Pharmacology

The efficacy and safety of parathion as a possible replacement for the pesticide DDT is reviewed. The synthesis and chemical properties of parathion are described. It is available in many registered formulations and physical forms. Parathion has a broad spectrum of effectiveness against insects and mites. Pharmacological and toxicological studies show that it is toxic to all species studied by all routes of administration; it causes the irreversible binding of paroxon to cholinesterase. Tolerances for parathion residues have been established for about 100 raw agricultural commodities. The acceptable daily intake has been set at 0.005 mg/kg body weight. The major hazard of parathion use is its acute toxic hazard to man and higher organisms. Limitations of available scientific data are listed. Efficacy data are presented for numerous crop-pest combinations. Cost effectiveness is demonstrated for three major cotton, two sorghum, one wheat, two corn, three potato, and three vegetable/fruit pests. This review is a compilation and summarization of available material, rather than an interpretation, of published and unpublished scientific and use data from various sources. (Buchanan-Davidson--Wisconsin).
W76-07612

A WATER QUALITY CONTROL PROGRAM,
Publishers Paper Co., Oregon City, Oreg.
For primary bibliographic entry see Field 5D.
W76-07642

PROBLEMS RELATED TO THE RENEWED GROUNDWATER LEVEL RISE IN PREVIOUS MINING AREAS AS ILLUSTRATED BY THE SOUTHERN LUSATIA EXAMPLE (PROBLEME DES GRUNDWASSERWIEDERANSTIEGS IN EHEMRLIGEN BERGBAUGEBIETEN AM BEISPIEL DER SUED-LAUSITZ),
For primary bibliographic entry see Field 5B.
W76-07663

THE WATER AND TOTAL OPTIMIZATIONS OF WET AND DRY-WET COOLING TOWERS FOR ELECTRIC POWER PLANTS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 3E.
W76-07674

TWO TRILLION OR THREE: THE COST OF WATER QUALITY GOALS,
New York State Dept. of Environmental Conservation, Albany.
D. F. Metzler, and F. O. Bogedain.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Water Resources Research Institute, North Carolina State Univ., Raleigh, p. 17-28. 2 fig., 7 tab., 3 ref.

Descriptors: *Water quality standards, *Costs, *Water pollution control, *Tertiary treatment, Economic impact, Estimated costs, Water policy, Pollution abatement.
Identifiers: *Zero discharges.

The concept of 'zero discharge' as a water pollution control measure is evaluated in relation to estimated costs and the consequent economic impact. By applying Robert Smith's compilation of cost information for conventional and advanced wastewater treatment, capital and operating costs are estimated for 100% BOD and SS removal from New York State's wastewaters as $239.5 billion; also a distinction is made between 100% removal and 'zero discharge,' as the latter would include costs for land and conveyances for disposal. The figure for land costs is computed at $3.6 billion. It is proposed that instead of setting very high water quality goals and providing funding for lesser objectives, a national effort be made to develop comprehensive sewage facility plans. These plans would evaluate alternative solutions for secondary, tertiary, and complete levels of waste treatment as a mechanism for determining the costs and benefits of each alternative, and then could be used in guiding a decision as to national standards, or in fact, whether national standards are desirable. The approximate costs of achieving national treatment goals of 'zero discharge' as proposed in S. 2770 would range up to 3 trillion dollars over a 25 year period and up to several hundred billion in New York State alone. (See also W74-05629) (Auen-Wisconsin)
W76-07686

COST EFFECTIVENESS OF REGIONAL WATER QUALITY MANAGEMENT: SOME SELECTED CASE STUDIES AND GENERAL IMPLICATIONS,
Manhattan Coll., Bronx, N. Y. Dept. of Civil Engineering.
R. V. Thomann.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Water Resources Research Institute, North Carolina State Univ., Raleigh, p. 57-66. 4 fig., 3 tab., 6 ref.

Descriptors: *Water pollution control, *Economic efficiency, *Sewage treatment, *Marginal costs, Organic wastes, Sewage effluents, Atlantic Coastal Plain, Dissolved oxygen, Regional analysis, New York, Massachusetts, Delaware River.
Identifiers: *Zero waste discharge, Boston Harbor(Mass), New York Harbor(NY), Delaware Estuary(Del).

It is postulated that it would be fallacious to ignore the interaction between biodegradable organic waste discharges and water quality in order to institute waste treatment programs based solely on arbitrary waste effluent and water quality standards. To substantiate the lack of cost efficiency, the water quality responses of the highly urbanized Boston Harbor, New York Harbor, and the Delaware Estuary, to three treatment levels are calculated and shown to be about 0.1-0.5 mg/l DO increase for every 100,000 lb/day removed by a treatment program and the marginal increase in DO at the upper levels of treatment would be about 0.1-0.2 mg/l. Cumulative DO responses would be about 2-3 mg/l, primarily resulting from treatment upgraded to the secondary with nitrification level. It is estimated that it would cost about $200-250 million annually to go from secondary with nitrification to 99% removal. The water quality improvement for this expenditure would be less than 0.5 mg/l DO with the result that these regions would be spending about $50 million annually for a 0.1 mg/l DO improvement with no potential for new uses of these waters. If these metropolitan regions were forced to install ultimate treatment (if technologically possible) an annual $200 million would be inefficiently spent. (See also W74-05629) (Auen-Wisconsin)
W76-07687

WATER RESOURCES ISSUES AND THE 1972 UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
W. H. Matthews.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Water Resources Research Institute, North Carolina State Univ., Raleigh, p. 136-148. 1 fig.

Descriptors: *United Nations, *Conferences, Water resources, *Environment, Social aspects, Institutions, Natural resources, International waters, Pollution abatement.
Identifiers: International cooperation.

The objectives of the conference were related to the improvement of human settlements and health; development and use of fresh water, land and energy resources; harmonizing development goals and social and cultural values with environmental quality objectives; and protection of living resources, and of the oceans, and avoidance of inadvertent climate modifications, which evolved in an Action Plan. Water quality concern emerged as the central issue, yet this concern was accompanied by uneasiness over the concept of water quality standards, lest efforts to achieve such standards constrain economic progress or divert investment from development priorities to pollution abatement. The emphasis of the Action Plan at the international level was on assessment--research, monitoring, and information exchange--not on international control and regulation. In essence, this reflected a political willingness to recognize the potential seriousness of environmental problems but a reluctance to act decisively on control based on what policy makers understood about these problems and their implications. The political consensus on assessment rather than on the institution of effective management approaches was because the policy makers were not aware of much of the scientific and technical work that was already available. The desire for more knowledge is explicit--the willingness to act on it when it is obtained is implicit. (See also W74-05629) (Auen-Wisconsin)
W76-07688

FINANCING AND CHARGES FOR WASTEWATER SYSTEMS: ACTIVITIES OF THE JOINT WPCF/ASCE/APWA COMMITTEE,
Hazen and Sawyer, New York.
C. R. Walter.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Water Resources Research Institute, North Carolina State Univ., Raleigh, p. 168-171.

Descriptors: *Waste water treatment, *Income, *Rates, Taxes, Cost repayment, Sewage treatment, Financing, Pollution abatement.
Identifiers: Joint WPCF/ASCE/APWA Committee.

A summation of the 1972 draft report of the Joint Water Pollution Control Federation/American Society of Civil Engineers/American Public Works Association Committee discusses the principle for determining revenue for a waste water treatment system. The basic philosophy is that both users and non-users should pay for a treatment system in proportion to their use and/or their benefit and that the system's operation should be self-sustaining. Equitable use rates should be based on a specific parameter--BOD, suspended solids, settleable solids--and that parameter used as a surcharge rather than as a basic charge. Thus dischargers whose effluents impose costs exceeding the average would be charged for that excess on a fair basis; but unless it is an extremely strong waste, the basic charge would be determined by the rate of flow. When a new community is provided with a sewer system, property taxes are the usual way--but not the only--equitable method to generate revenues. A good portion of the charge must be included in the tax because a new development does not have enough users for the excess capacity provided. The tax base of fully developed municipalities should also support the waste treatment system. (See also W74-05629) (Auen-Wisconsin).
W76-07689

PUBLIC PERCEPTION OF POLLUTION CONTROL,
Council on Environmental Quality, Washington, D.C.
R. Cahn.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Water Resources Research Institute, North Carolina State Univ., Raleigh, p. 210-217.

Descriptors: *Pollution abatement, *Attitudes, *Social value, Environment, Judicial decisions, Legislation, Social participation.
Identifiers: *Quality of life.

Environmental activists have induced legislation and court decisions at the federal and state levels and the general public appears to be increasing its perceptions of the quality of life, but the public does not yet have sufficient awareness of the comprehensiveness of the environmental problems, how to solve them, and a willingness to expend the effort. Some results of public polls indicated that on a scale of $10, $50, and $100 tax for environmental improvement, only 8% were willing to pay $100 or more and only 29% were willing to pay $100 or more for a pollution-free car. The inference of the polls was that the public is really not willing to pay the cost of cleaning up pollution. Research, education, business leaders, and individuals should increase public perception of the total costs and benefits of environmental quality so that all actions would be considered in relation to their impact on the environment. The public must also face the larger issues of the quality of life as exemplified in the debate on the limits to growth, income distribution, and effective allocation of depletable resources. (See also W74-05629) (Auen-Wisconsin)
W76-07690

INTENSIFIED FISH CULTURE COMBINING WATER RECONDITIONING WITH POLLUTION ABATEMENT,
Kramer, Chin and Mayo, Seattle, Wash.
P. B. Liao, and R. D. Mayo.
Aquaculture, Vol. 3, No. 1, p. 61-85, February, 1974. 13 fig., 2 tab., 27 ref.

Descriptors: *Fish hatcheries, *Aquaculture, Water pollution sources, *Water pollution control, *Pollution abatement, Water reuse, *Recirculated water, *Fish toxins, *Nitrites, Water quality, Fish farming, Fish handling facilities, Fisheries, Commercial fish, Water conservation, Nitrogen compounds, Waste water(Pollution).
Identifiers: *Water reconditioning.

Demand for game and commercial fish has increased and the decreased availability of good quality water has stimulated efforts to obtain more fish production with less water. The pollution potential of fish hatcheries requires proper control. Water reconditioning and reuse can provide pollution abatement and increase a hatchery's fish carrying capacity tenfold as compared to a single pass system. Requirements for removal of ammonia, nitrite and solids are discussed after an examination of various water reconditioning systems. (Katz)
W76-07711

WILL INDUSTRY MEET WATER QUALITY REQUIREMENTS,
G. Dallaire.
Civil Engineering-ASCE, Vol. 45, No. 12, p 68-72, December 1975. 4 fig.

Descriptors: *Cost-benefit analysis, *Economic impact, *Environmental control, Laws, Legislation, Environmental impact, Water quality, Water requirements.
Identifiers: *Water Pollution Control Act Amendments of 1972, *National Commission on Water Quality, Best practicable technology(BPT), Best available technology(BAT), Biological oxygen demand.

Preliminary findings of the National Commission on Water Quality study to determine the impact of the Water Pollution Control Act Amendments of 1972 on American industry are outlined. In the Act certain requirements were to be fulfilled by 1977 and 1983. By 1977 the best practicable technology (BPT) is to be installed, and by 1983 the best available technology (BAT) must be used. Some of the findings were: with few exceptions industry will experience long-run price increases due to 1977 BPT standards; 1983 BAT standards will produce greater long-run price increases; plant closures are significant in 6 industries- pulp and paper, metal finishing, textiles, fruits and vegetables, feedlots, and meat packing; BPT will have a greater economic impact on industry than BAT; regional impacts are concentrated in the Northeast, and to a lesser extent, in the Mid-Atlantic and North Central regions; shortage of capital and manpower could hinder industry's abilities to meet BPT by 1977. Industry argues that a pause is necessary after 1977 to assess costs vs. benefits. Skyrocketing costs as zero discharge is approached is cited as an example. Industry questions the wisdom of a blanket requirement for BAT, saying economic cost vs. environmental benefits should be weighed. The Commission did not question the 1983 BAT requirements but advocated it be moved back to 1985. Key benefits from meeting the law's goals are: better water quality raises property values near water; reopened beaches stimulate economic activity; increased commercial and recreational fishing in marine waters; increased freshwater fishing. (Gentry - North Carolina)
W76-07736

SOME COMMENTS ON PROBLEMS OF WASTE DISPOSAL IN THE METAL FINISHING INDUSTRY.
For primary bibliographic entry see Field 5E.
W76-07754

PROCEEDINGS: LAKE TAHOE RESEARCH SEMINAR II, 27 SEPTEMBER 1974, SANDS VAGABOND CONVENTION CENTER, SOUTH LAKE TAHOE, CALIFORNIA,
Lake Tahoe Area Research Coordination Board South Lake Tahoe, Calif.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-240 549, $5.00 in paper copy, $2.25 in microfiche. Report No. NSF/RA/G-74-012. 88 p. (1975). NSF GT-39556.

Descriptors: *Water pollution, *Air pollution, *Erosion, *Waste water treatment, *Conferences, Domestic wastes, Ammonia, Pollutants, Lakes, Management, Administration, Political aspects, Salt tolerence, Vegetation effects, Weather modification, California, Nevada.
Identifiers: *Lake Tahoe (Nev - Calif).

Lake Tahoe Research Seminars are held quarterly to inform the public and interested researchers of current research projects and to develop lines of communication among those interested and involved in solving the problems of the Tahoe Basin. Topics discussed at the Research Seminar II (September 27, 1974) included: 'Preliminary Study of Experimental System for Ammonia Removal at South Lake Tahoe Advanced Wastewater Treatment Plant,' 'The Scientist and Decision-Making at Lake Tahoe,' 'Conifer Damage and Death Associated with the Use of Highway Deicing Salt in the Lake Tahoe Basin of California and Nevada,' 'Air Quality of the Tahoe Basin,' 'Weather Modification in the Lake Tahoe Basin,' and 'Erodibility of Tahoe Soils.' (See W76-07794 thru W76-07799) (Sims - ISWS)
W76-07793

PRELIMINARY STUDY OF EXPERIMENTAL SYSTEM FOR AMMONIA REMOVAL AT SOUTH LAKE TAHOE ADVANCED WASTEWATER TREATMENT PLANT,
For primary bibliographic entry see Field 5D.
W76-07794

THE SCIENTIST AND DECISION MAKING AT LAKE TAHOE,
For primary bibliographic entry see Field 6B.
W76-07795

CONIFER DAMAGE AND DEATH ASSOCIATED WITH THE USE OF HIGHWAY DEICING SALT IN THE LAKE TAHOE BASIN OF CALIFORNIA AND NEVADA,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
For primary bibliographic entry see Field 5C.
W76-07796

AIR QUALITY IN THE LAKE TAHOE BASIN,
California Univ., Davis. Inst. of Ecology; and California Univ., Davis. Dept. of Physics.
For primary bibliographic entry see Field 5A.
W76-07797

WEATHER MODIFICATION IN THE LAKE TAHOE BASIN,
For primary bibliographic entry see Field 3B.
W76-07798

ERODIBILITY OF TAHOE SOILS,
For primary bibliographic entry see Field 2J.
W76-07799

PROPOSED KAIPAROWITS PROJECT, FINAL ENVIRONMENTAL IMPACT STATEMENT.
For primary bibliographic entry see Field 6G.
W76-07800

NEBRASKA DISPOSAL WELLS REGULATIONS.
Nebraska State Dept. of Environmental Control, Lincoln.
In: 1973 BNA Environmental Rep. 836:0621-24 (Neb. Environ. Control Council Rules and Regs., 1972). 4 p.

Descriptors: *Nebraska, *Waste disposal wells, *Waste water disposal, *Underground waste disposal, *Design criteria, Design data, Water resources, Waste disposal, Depth, Permits, Hydrologic aspects, Geologic formations, Monitoring, Injection wells, Injection, Equipment, Penalties(Legal), Groundwater, Subsurface waters, Legislation.

In order to protect groundwater and other subsurface resources from pollution, the State of Nebraska will henceforth require a permit be obtained before any person may erect, alter or operate any waste disposal well. The information required in the application for the permit will vary, depending on whether a construction permit is desired. Applications for a construction permit must contain the following: (1) information concerning general conditions, such as a map of the proposed site, a description of the depth of the wells, and a description of all mineral and water resources within the area of the system; (2) an evaluation of geologic and hydrologic conditions; (3) a summarization of the design and construction of the disposal well; (4) pertinent information concerning the disposal system; and (5) an analysis of the operation of the system, including any plans for monitoring critical factors. Before any approval will be given for an operating permit, the application must contain the design of the well within prescribed specifications, an evaluation of the injection zone, and a surface equipment design. To insure compliance with the above requirement, criminal and civil penalties are provided for violations. (Hoffman-Florida)
W76-07801

REGISTRATION OF LIQUID WASTE HAULERS AND WASTE DISPOSAL TO LAND,
In: 1975 BNA Environmental Rep. 721:0532-36 (Calif. Water Code). 7 p.

Descriptors: *California, *Liquid wastes, *Transportation, *Waste disposal, *Permits, Legislation, Water quality control, Waste dumps, Waste water disposal, Administrative agencies, Sewage, Sewage disposal, Disposal, Drainage systems, Administrative decisions, Landfills.

In order to protect the quality of state waters, California requires that all liquid waste haulers be registered. Provisions pertaining to the application for, suspension or revocation of this registration are presented. Any liquid wastes carried by registered haulers may be disposed of only as authorized by statute or at an approved disposal site. Under no circumstances may the wastes be discharged into a community sewer system without the written approval of the operator of the system. Wastes may also not be discharged into drainage systems unless the waste discharge characterisitics are in conformance with requirements prescribed by the regional water quality control board. To insure compliance with these discharged directives, all haulers must maintain legible records of each load hauled and must make them available for review by authorized state or regional board personnel. (Hoffman-Florida)
W76-07802

MIXING OIL AND WATER: THE EFFECT OF PREVAILING WATER LAW DOCTRINES ON OIL SHALE DEVELOPMENT,
Kutak, Rock, Cohen, Campbell, Garfinkle and Woodward, Omaha, Nebr.
For primary bibliographic entry see Field 6E.
W76-07806

ENVIRONMENTAL LAW: WHAT IS 'MAJOR' IN 'MAJOR FEDERAL ACTION', MINNESOTA PUBLIC INTEREST RESEARCH GROUP V. BUTZ, 498 F2D 1314 (8TH CIR. 1974).
For primary bibliographic entry see Field 6E.
W76-07809

STATE RESPONSIBILITY AND THE LAW OF INTERNATIONAL WATERCOURSES,
Lewis Univ., Lockport, Ill. Coll. of Law.
For primary bibliographic entry see Field 6E.
W76-07811

OIL TANKER POLLUTION CONTROL: DESIGN CRITERIA VS EFFECTIVE LIABILITY ASSESSMENT,
Department of the Treasury, Washington, D.C.
P. A. Cummins, D. E. Logue, R. D. Tollison, and T. D. Willett.
Journal of Maritime Law and Commerce, Vol. 7, No. 1, p. 169-208 (1975). 32 p, 15 tab.

Descriptors: *Ships, *Design criteria, *Oil spills, *International waters, *Oil industry, Oceans, Transportation, Waste water disposal, Water pollution sources, Water pollution abatement, Water pollution control, Fuels, Navigation, Law of the sea, United Nations, International law, Penalties(legal), Oil pollution, United States.
Identifiers: *Oil tankers, *Oil transportation, Marine environment, Maritime law, Shipping, Coast Guard, United Nations Conference on the Law of the Sea, Ship design.

The problem of damage to the marine environment from oil tanker spillage has drawn the attention of Congress and the U.S. Coast Guard, the International Marine Consultative Organization, and the United Nations Conference on the Law of the Sea. One important issue is whether there should be international minimum pollution control standards or whether each nation should impose its own standards, taking the risk that each nation's shipping costs will be as high as its standards are stringent. Another important issue involves the merits of standards based on ship design as opposed to standards of liability assessment for damages caused by oil shippers. Under the former proposal, oil shippers would not be held liable for oil spill damages if their ship complied with applicable design standards. The primary types of design criteria include the following: load-on-top, single-skin segregated ballast and double-skin segregated ballast. The authors discuss the characteristics of each type and analyze the relative costs and benefits using cost projections of total construction and annual separation along with estimated costs of spills and clean-up which might be likely to result from the alternative technologies. The effects of adopting these design criteria are compared with standards achievable by damage liability assessment. (Sloan-Florida)
W76-07812

THE REGULATION OF DEEPWATER PORTS,
K. A. Graham.
Virginia Journal of International Law, Vol. 15, No. 4, p 927-57 (1975). 31 p.

Descriptors: Oil industry, *Port authorities, *Oil spills, Ships, Environmental effects, Economic efficiency, Economic justification, Ecology, Deep water, Shore protection, International Law, Structural engineering, Oil, *Regulation, Oil pollution.
Identifiers: *Deepwater ports, *Deepwater Port Act, Very large crude carriers, Ports, Licenses.

The United States' need for tremendous quantities of imported oil has led to the concurrent need for safe and economical facilities in which the very large crude carriers can discharge their cargo. This note examines and evaluates the advantages, disadvantages and side-effects of deepwater ports and of the new governing legislation, the Deepwater Port Act of 1974 (D.P.A.). Discussed first

are the economic aspects of offshore oil ports. The author concludes that neither transshipment of refined petroleum products nor increased traffic in smaller tankers is an economically or environmentally acceptable alternative to deepwater ports. Also examined are the environmental effects of deepwater ports, the merits and shortcomings of the D.P.A. from the environmentalists' perspective, and the issue of federal and state control over licensing and regulation of deepwater ports in light of the D.P.A. The author suggests that the D.P.A. may have given the states too much control over the regulation of the deepwater ports.
W76-07813

ENVIRONMENTAL ASPECTS OF DEEP SEA MINING,
Center for Law and Social Policy, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-07815

CLEAN WATER FOR MID-AMERICA.
Federal Water Pollution Control Administration, Chicago, Ill. Great Lakes Region.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-241 292, $4.00 in paper copy, $2.25 in microfiche. April, 1970. 30 p, 4 map, 12 photo, 4 draw, 1 chart.

Descriptors: *Great Lakes, *Mississippi River, *Federal Water Pollution Control Act, *Water pollution control, Water quality, Water pollution, Water Quality Act, Federal government, Great Lakes Region, Films, Publications, Water pollution sources, Pollution abatement, Water management(Applied).
Identifiers: *Federal Water Pollution Control Administration, *Federal Clean Water Program, Non-degradation.

This booklet presents the programs that the Federal Water Pollution Control Administration (FWPCA) and the states comprising the Great Lakes Region have initiated to control the serious pollution problems facing the Great Lakes and the Upper Mississippi River through affirmative enforcement of the Federal Clean Water Program. Background information on the FWPCA is briefly presented describing the Administration's purpose and legal background, and its programs and operations especially in conjunction with supporting state, city, and industry programs. This profile specifically identifies particular pollution problems confronting each of the Great Lakes, and the Upper Mississippi River; furthermore, it introduces new problems, and indicates the specific solutions that the Federal Water Pollution Control Administration and the Great Basin States are implementing. Lists of Pollution Control Agencies and their locations, and lists of available films and Clean Water Publications are also contained within. (Hadoulias-Florida)
W76-07821

THE ROLE OF NORTH CAROLINA IN REGULATING OFFSHORE PETROLEUM DEVELOPMENT,
North Carolina Univ. at Chapel Hill. School of Law.
For primary bibliographic entry see Field 6E.
W76-07822

LEGAL CONSIDERATIONS FOR THE CONSTRUCTION AND OPERATION OF A DEEPWATER OIL TERMINAL IN THE DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 6E.
W76-07823

MAJOR ISSUES OF THE LAW OF THE SEA,
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 6E.
W76-07827

MARINE POLLUTION,
New Hampshire Univ., Durham. Law of the Sea Intern Program.
For primary bibliographic entry see Field 6E.
W76-07836

CONCLUSION,
New Hampshire Univ., Durham. Law of the Sea Intern Program.
For primary bibliographic entry see Field 6E.
W76-07842

PREPARATION OF WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 230, p 55343-49, November 28, 1975. 7 p.

Descriptors: *Federal Water Pollution Control Act, *Sewage effluents, *Pollution abatement, *Industrial wastes, *Domestic wastes, Municipal wastes, Water pollution sources, Water pollution effects, Water pollution control, Water pollution treatment, Water quality control, Administrative decisions.
Identifiers: Administrative regulations, FWPCA Amendments of 1972, Non-point sources(Pollution).

Pursuant to the Federal Water Pollution Control Act Amendments of 1972 the Environmental Protection Agency has promulgated regulations describing the requirements for preparation of state water quality management plans. The objective of the plans is to achieve the 1983 national water quality goal. The plans must be submitted by the states by November 1, 1978. Each plan must include: planning boundaries; water quality assessment and segment classifications; inventories and projections of municipal and industrial pollutant sources; non-point source assessments; applicable water quality standards; total maximum daily loads allowable of relevant pollutants; point source load allocations for each water quality segment for the next five plan years; municipal waste treatment system needs in five year increments for a twenty year period; industrial waste system needs; non-point source control needs; residual waste control needs; urban and industrial stormwater needs; target abatement dates; and statements of environmental, social and economic impact. (Comer-Florida)
W76-07843

ORE MINING AND DRESSING POINT SOURCES CATEGORY, INTERIM FINAL RULES.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 215, p 51722-37 November 6, 1975. 16p, 17 tab.

Descriptors: *Mine wastes, *Waste disposal, *Administrative agencies, *Waste water treatment, *Pollution abatement, Legislation, Water pollution, Conservation, Water quality, Regultion, Pollutants, Impaired water quality, Water pollution treatment, Waste water(Pollution), Legal aspects, Water quality standards, Water purification, Standards, Classification.
Identifiers: Effluent limitations, Point sources(Pollution), Administrative regulations, Demineralization.

The Environmental Protection Agency has set forth interim final rules for effluent limitations and guidelines for the Ore Mining and Dressing point source category pursuant to the Federal Water Pollution Control Act. The regulation mentions the legal authority for the regulations applicable to standards of performance for new and existing point sources. Also discussed are the following: (1) categorization of the point sources; (2) waste characteristics; (3) the origin of waste water pollutants evident in the ore mining and dressing sector; (4) waste water treatment and control technologies for each subcategory; (5) cost estimates for control of waste water pollutants; (6) energy requirements and non-quality environmental impacts; and (7) an analysis of the economic impact of compliance with the regulation. (Griffith-Florida)
W76-07844

ORE MINING AND DRESSING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 215, p 51738-47, November 6, 1975. 12p, 32 tab.

Descriptors: *Classification, *Mine wastes, *Waste water treatment, *Pollution abatement, *Water pollution sources, Water pollution, Water pollution control, Water pollution treatment, Water quality, Control, Regulation, Pollutants, Administrative decisions, Water treatment, Mine wastes, Waste water(Pollution), Water purification, Legal aspects, Legislation, Conservation, Water quality standards, Standards, Waste disposal.
Identifiers: Effluent limitations, Point sources(Pollution), Demineralization, Administrative proposals.

The Environmental Protection Agency has proposed various effluent guidelines and standards of performance, which will amend the Ore Mining Point Source Category pursuant to sections 306(b) and 307(b) and (c) of the Federal Water Pollution Control Act. The proposal places time restrictions on the implementation of effluent limitations of both existing and new point sources. These limitations focus on the implementation of the greatest degree of effluent reduction which the Administrator determines to be available through demonstrated control technology, processes, operating methods, or other alternatives. The proposed regulation sets forth pretreatment standards for pollutants introduced into publically owned treatment plants, rather than to discharges of pollutants into navigable waters. The standards of performance, pretreatment standards and effluent limitation guidelines are individually listed for: (1) iron ore; (2) base and precious metals; (3) bauxite; (4) ferroalloy ores; (5) uranium, radium and vanadium ores; (6) mercury ore; and (7) titanium ore. (Griffith-Florida)
W76-07845

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION CONCENTRATED ANIMAL FEEDING OPERATIONS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 225, p 54182-86, November 20, 1975. 5p.

Descriptors: *Administrative decisions, *Feed lots, *Permits, *Waste disposal, *Navigable waters, Administrative agencies, Regulation, Pollutants, Legislation, Legal aspects, Water quality, Effluents, Waste water(Pollution), Water quality control, Wastes, Conservation, Farm wastes, Water pollution, Animal wastes(Wildlife).
Identifiers: Administrative regulations, National Pollutant Discharge Elimination System.

In response to its concern over the discharge of pollutatns from various point sources, the Environmental Protection Agency (EPA) has proposed regulations for concentrated animal feeding operations. The proposed regulations delineate the scope of the National Pollutant Discharge Elimination System (NPDES) permit program. The proposed regulations define

'concentrated animal feeding operation' in terms of three criteria. If any one of these three criteria apply to a particular animal feeding operation, the facility will be required to apply for and obtain a permit. However, no permit is required by the owner if: (1) there is no discharge of a pollutant; (2) the discharge of a pollutant does not reach navigable waters; or (3) the only time a discharge of pollutants into navigable waters occurs is during a 25 year, 24 hour rainfall event. The regulation also permits a case by case determination that a particular animal feeding operation is a point source subject to regulation. Comments upon all aspects of the proposed regulation are solicited by the EPA. (Griffith-Florida)
W76-07846

COAL MINING POINT SOURCE CATEGORY: APPLICATION OF EFFLUENT LIMITATIONS GUIDELINES FOR EXISTING SOURCES TO PRETREATMENT STANDARDS FOR INCOMPATIBLE POLLUTANTS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 202, p 48839-40, October 17, 1975. 2p.

Descriptors: *Federal Water Pollution Control Act, *Water treatment, *Waste treatment, *Coal mine wastes, *Treatment facilities, Coal mines, Mine wastes, Water pollution sources, Industrial wastes, Environmental effects, Cost-benefit ratio, Effluents, Industrial effluents, Discharge(Water), Industrial water, Administrative agencies, Decision making, Policy, Pollutants, Compatibility.
Identifiers: *Point sources(Pollution), Administrative regulations, Effluent limitations.

Pursuant to the authority of the Federal Water Pollution Control Act, the Environmental Protection Agency has proposed to amend the coal mining point source category regarding the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. The proposal will establish for each subcategory therein the extent of application of effluent limitations guidelines to existing sources which discharge to publically owned treatment works. The agency developed its proposal after consideration of the following factors: (1) the pollutants present in waste waters resulting from the mining and preparation of coal, the characteristics of these pollutants, and the degree of pollutant reduction attainable; (2) the anticipated effects on other aspects of the environment of the treatment technologies available; and (3) the estimated cost and energy consumption implications of those technologies and their potential effects on cost and production of coal. The agency now believes that the effluent limitations guidelines should not be applied to pretreatment standards for the introduction of incompatible pollutants into municipal systems by existing sources in the coal preparation, coal storage, refuse storage, and coal preparation ancillary area, nor in the acid or ferruginous mine drainage and the alkaline mine drainage subcategories. The operator of a publically owned treatment works is cautioned that some of the constituents of the waste waters may interfere with certain treatment works or may pass through such works inadequately treated. (Reinders-Florida)
W76-07847

COAL MINING POINT SOURCE CATEGORY, INTERIM FINAL RULE MAKING.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 202, p. 48830-38, October 17, 1975. 9 p, 6 tab.

Descriptors: *Effluents, *Coal mine wastes, *Acidic mine water, *Chemical wastes, *Classification, Industrial wastes, Waste water treatment, Waste water disposal, Waste water(Pollution), Environmental control, Solid wastes, Airation, Filtration, Administrative agencies, Standards, Administrative decisions.
Identifiers: Effluent limitations, *FWPCA amendments of 1972, Administration regulations.

Pursuant to the authority of the Federal Water Pollution Control Act, the Environmental Protection Agency has promulgated interim final rules establishing a coal mining point source regulation category. The agency also proposes standards for existing source pretreatment within the category. Four coal mining point source subcategories, coal preparation plants, ancillary areas, acid or ferruginous mine discharge, and alkaline mine drainage, are identified. For existing point sources within these subcategories the following effluent limitations are proposed: for coal preparation plants, no process water discharge; for all other subcategories, daily and average daily values for thirty consecutive day periods expressed in milligrams per unit for iron, aluminum, manganese, nickel, zinc and TSS. Ranges for pH levels are proposed. The proposed standards express maximum amounts allowable using best available technology. Other pollutants were considered before the proposal publication but the level observed does not warrent consideration of limitations. (Comer-Florida)
W76-07848

MINERAL MINING AND PROCESSING POINT SOURCE CATEGORY INTERIM FINAL RULEMAKING.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 201, p 48652-64, October 16, 1975, 13p, 1 tab.

Descriptors: *Effluents, *Brine disposal, *Federal Water Pollution Control Act, *Mineral industry, *Waste water treatment, Waste water disposal, Environmental control, Acid mine water, Mine wastes, Mine drainage, Water pollution surces, Legislation, Classification, Standards, Waste disposal wells.
Identifiers: *Effluent limitations, FWPCA Amendments of 1972, Administrative regulations.

Pursuant to the Federal Water Pollution Control Act, the Environmental Protection Agency has promulgated interim final rules establishing a mineral mining and processing point source category and regulating same. The regulation treats 38 distinct subcategories of mineral mining and processing. Treatment technologies for 21 of the subcategories are undefined pending economic impact analysis of the draft recommendations. For the gypsum, asphaltic minerals, asbestos and wollastonite, borax, potash, sodium sulfate, Frasch sulfate, magnesite, diatomite, jade, novaculite and graphite subcategories, only the volume of water resulting from precipitation that exceeds the maximum safe surge capacity of an impoundment can be discharged. The safe surge level must be greater than normal operations by the rain representing the 10 year 24 hour rainfall event. No discharge of waste water pollutants may be made otherwise. Barite, bentonite, fluorspar and tripoli subcategory plants normally use no water for processing. For plants which use water, standards are still under study. Plants extracting salines from brine lakes normally discharge the bitterns into the intake body of water. Under the interim rules, no added constituents may be discharged into navigable waters. (Comer-Florida)
W76-07849

GRAIN MILLS POINT SOURCE CATEGORY: PROPOSED PRETREATMENT STANDARDS FOR NEW SOURCES.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 165, p 37052-54, August 25, 1975. 2 p.

Descriptors: *Federal Water Pollution Control Act, *Waste treatment, *Waste water disposal, *Mills, *Industrial water, Waste water treatment, Water law, Administrative agencies, Planning, Decision making, Water policy, Water control, Technology, Water quality, Industrial wastes, Water policy, Pollution abatement, Solid wastes, Disposal, Suspended solids, Water pollution sources.
Identifiers: *FWPCA Amendments of 1972, Administrative regulations, Point sources(Pollution).

Pursuant to the authority of the Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) has proposed amendments to the pretreatment standards for new sources in the Corn Wet Milling Subcategory. On May 5, 1975 the Eighth Circuit Court of Appeals remanded these pretreatment standards to the EPA, directing it to review paragraph (d) of section 128.131, as it applies to the corn wet milling industry through section 406.16, and to amend the regulation to define in a reasonably specific manner what it considers to be an excessive discharge to a publically owned treatment works over relatively short periods of time. In response to the remand, the EPA has developed a formula to quantify excessive loads from new corn wet mills to publically owned treatment works. The EPA solicited and examined a broad range of data and gave full consideration to such factors as waste characteristics, origin of waste water pollutants, and treatment and control technology. The proposed formula standard is explained in detail. (Reinders-Florida)
W76-07850

INK FORMULATING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS,
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol. 40, No. 145, p. 31726-28, July 28, 1975. 3 p.

Descriptors: *Water pollution abatement, *Standard, *Federal Water Pollution Control Act, *Industrial wastes, Industrial water, Solvents, Effluents, Economic impact, Discharge(Water), Chemical wastes, Waste identification, Water pollution sources, Water treatment, Oily water, Classification, Data collections.
Identifiers: *FWPCA Amendments of 1972, effluent limitations.

The Environmental Protection Agency, in formulating effluent limitations guideline for existing sources and standards of performance and pretreatment standards within the oil-base ink subcategory and the water-base ink subcategory of the ink formulating category of point sources, drew a distinction between plants using a solvent wash system and caustic wash system. The agency needs further data on the process using a caustic wash, and will promulgate standards at a later date. The agency has all the data necessary for the process using a solvent wash and has found that all of the oil-base solvent wash ink plants meet current standards. Because all oil-base solvent wash ink plants meet thet the requirements, there is minimal economic impact. (Edenfield-Florida)
W76-07851

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM,
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol. 40, No. 137, p. 29848-50, July 16, 1975. 3p.

Descriptors: *Federal Water Pollution Control Act, *Administrative agencies, *Discharge frequency, *Discharge measurement, *Sewage effluents, Industrial wastes, Water pollution sources, Water quality, Municipal water, Municipal wastes, Sewage, Water quality control, Legislation, Classification.
Identifiers: *Administrative regulations, *Effluent limitations.

Pursuant to authority of the Federal Water Pollution Control Act, the Environmental Protection Agency has promulgated amendments to the National Pollutant Discharge Elimination System regulations. One amendment requires municipal type facility applicants to file Standard Form A if the facility meets any of the following requirements: serves more than 10,000 people; discharges more than five million gallons on any day; receives industrial waste which totals more than 50,000 gallons on any day or more than 5% of facility volume in any day; or which receives wastes containing toxic pollutants or which, in combination with other substances, may adversely affect facility discharges. Another amendment requires no maximum daily quantitative limitation specification on publically owned treatment works permits. A third amendment requires permit effluent limitation expressions to be in gross terms unless the intake water body and discharge water body are the same and net term expression is required elsewhere, or intake water contains pollutants not removed by required treatment. The intake and discharge pollutants may not undergo chemical or biological change. To insure compliance with the above requirements, all permits issued pursuant to these regulations must require appropriate monitoring. (Comer-Florida)
W76-07852

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES,
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol. 40, No. 111, p. 24539-40, June 9, 1975. 2p.

Descriptors: *Federal Water Pollution Control Act, *Water pollution sources, *Industrial effluents, Discharge(Water), *Industrial water, *Impoundments, Pollution abatement, Effluents, Aluminum, Industrial wastes, Industrial plants, Water pollution, Water policy, Waste water(Pollution), Water law, Water management(Applied), Rainfall disposition, Water quality, Pollutants, Decision making, Administrative decisions, Administrative agencies.
Identifiers: *Effluent limitations, *Point sources(Pollution), Administrative regulations.

The Environmental Protection Agency (EPA) has invited proposals regarding suggested Amendments to Subparts A and C of 40 CFR Part 421 - Nonferrous Metals Manufacturing Point Source Category. In Part 421 the EPA established for the bauxite refining subcategory an effluent limitation of 'no discharge of process waste water pollutants to navigable waters'. The regulations do allow, however, for the discharge of excess rainfall that falls within an impoundment. Precise definition of the term 'within the impoundment' is therefore important. The effect of the proposed definition is to give credit for all rainfall within a defined extended drainage area, in the calculation of the volume of water which may be discharged from the impoundment. An amendment to Subpart C is also proposed to resolve an ambiguity in the regulation by making it clear that Subpart C will not apply at this time to wastes in a less significant waste stream including waste from furnace wet scrubbers. Interested persons are invited to submit written comments. (Reinders-Florida)
W76-07853

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol. 40, No. 200, p. 48348, October 15, 1975. 1 p.

Descriptors: *Federal Water Pollution Control Act, *Pollution abatement, Discharge(Water), *Effluents, Aluminum, Industrial wastes, Industrial plants, Water pollution, Water pollution sources, Waste water(Pollution), Water law, Water management(Applied), Rainfall disposition, Water quality, Pollutants, Inpoundments, Classification.
Identifiers: Effluent limitations, *Point sources(Pollution), Administrative regulations.

Pursuant to the authority of the Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) is establishing final amendments to the effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources in the nonferrous metals manufacturing category of point sources. These amendments specifically pertain to the bauxite refining subcategory(Subpart A) and the secondary aluminum smelting subcategory(Subpart C). Most operators of bauxite refining plants collect the plants rainfall runoff in mud ponds or some other storage reservoir. By suitable water management techniques, it is the opinion of the EPA that there is no need for the relatively uncontaminated stormwater to contact and mix with process waste water. This final amendment limits discharges of such process waste water but does not limit the discharge of rainfall runoff. To aid in the implementation of these directives, specialized definitions of the terms 'within the impoundment' and 'pond water surface area' are presented. The final amendments also provide that the provisions of the secondary aluminum smelting subcategory will apply to discharges of fume-scrubbing wastewaters where aluminum floride or chlorine is used in the magnesium removal process. The provisions will also apply to wet residue milling and metal cooling wastewaters resulting from the use of aluminum scrap needed to produce metallic aluminum alloys. (Reinders-Florida)
W76-07854

CANNED AND PRESERVED FRUITS AND VEGETABLES PROCESSING INDUSTRY POINT SOURCE CATEGORY, INTERIM FINAL RULE MAKING,
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol. 40, No. 204, p. 49222-35, October 21, 1975. 14 p, 7 tab.

Descriptors: *Federal Water Pollution Control Act, *Classification, *Effluents, *Chemical wastes, *Biochemical oxygen demand, Acidic water, Organic wastes, Environmental control, Industrial wastes, Waste water treatment, Waste disposal, Environmental sanitation, Waste water(Pollution), Administrative agencies, Standards.
Identifiers: *Effluent limitations, *FWPCA Amendments of 1972, Administrative regulations.

Pursuant to the authority of the Federal Water Pollution Control Act, the Environmental Protection Agency has promulgated interim final rules establishing effluent limitations for large sources in the canned and preserved fruits and vegetables processing industry point source category. The Agency also proposes standards for maximum sources in the category. Large sources process total raw materials totaling more than 10,000 tons per year. Three sub-categories exist; canned and preserved fruits, canned and preserved vegetables, and canned and miscellaneous specialties. Significant pollutant parameters identified in all sub-categories include biochemical oxygen demand (BOD 5), total suspended non-filterable solids (TSS), fecal coliforms and pH. Oil and grease are also significant in specialty processing. Effluent limitations are expressed in both metric and English units for identified fruits, vegetables, or specialties within each sub-category. Proposed amendments include standards based on best available technology economically achievable for existing sources. The interim final rule applies best technology currently available. (Comer-Florida)
W76-07855

IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY PROPOSED EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 40, No. 163, p. 36708-44, August 21, 1975. 37p, 104 tab.

Descriptors: *Federal Water Pollution Control Act, Effluents, *Brine disposal, *Acidic water, *Industrial wastes, Waste water treatment, Environmental control, Waste identifications, Waste water disposal, Water pollution sources, Waste water(Pollution), Sludge, Sludge treatment.
Identifiers: *Effluent limitations, *FWPCA Amendments of 1972, Administrative regulations.

Pursuant to the authority of the Federal Water Pollution Control Act, the Environmental Protection Agency has proposed effluent limitations and guidelines for existing sources in the iron and steel manufacturing category. Tentative proposals are also presented for new category sources. The proposals will add fourteen new sub-categories based upon processing method. Effluent limits are proposed on the basis of application of the best practicable control technology currently available and on the basis of the best available technology economically achieveable. Standards are separately stated for new source performance and for new source pretreatment. The sub-categories identified are: hot forming, section; hot forming, flat; pipes and tubes; pickling, sulfuric acid, batch; pickling, hydrochloric acid, batch and continuous; cold rolling; hot coatings, galvanizing; hot coatings, terne; miscellaneous runoff, storage piles, casting and slagging; cooling water blowdown, utility blowdown; maintenance department wastes; and central treatment. Each subcategory is given separate standards based upon water use and pollutant result. Proposed maximum effluent limitations are expressed in metric and English units. (Comer-Florida)
W76-07856

CANNED AND PRESERVED FRUITS AND VEGETABLES PROCESSING INDUSTRY POINT SOURCE CATEGORY PROPOSED EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol. 40, No. 204, p. 49237-65, October 21, 1975. 29p, 24 tab.

Descriptors: *Federal Water Pollution Control Act, *Effluents, *Chemical wastes, *Biochemical oxygen demand, *Acidic water, Waste disposal, Waste water treatment, Environmental sanitation, Industrial wastes, Waste water(Pollution), Organic wastes, Environmental Control, Hydrogen ion concentration.
Identifiers: *Effluent limitations, *FWPCA Amendments of 1972, Administrative regulations.

Pursuant to the Federal Water Pollution Control Act, the Environmental Protection Agency proposes regulations establishing effluent limitations for the canned and preserved fruits and vegetables processing industry category. These proposals will affect effluent limitations for existing sources, pretreatment standards for existing sources, and performance and pretreatment standards for new sources. The proposals are particularly concerned with limitations for medium sized plants, which are defined as plants processing between 2,000 and 10,000 tons of raw materials per year. Each subcategory, canned and preserved fruits, canned and preserved vegetables, canned and miscellaneous specialties,is further divided into identifiable fruits, vegetables and specialties for effluent limitation establishment. Each of these subcategories must meet specified limitations pertaining to the following factors: biochemical oxygen demand, total suspended nonfilterable solids, fecal coliforms, hydrogen ion concentration, and oil and grease concentrations. Guidelines pertaining to these limitations are expressed both

in terms of best practicable control technology currently available and best available technology economically achieveable. Pretreatment standards are separately expressed as are new source standards. (Comer-Florida)
W76-07857

DEVELOPMENT OF NEW REGULATIONS BY THE CORPS OF ENGINEERS, IMPLEMENTING SECTION 404 OF THE FEDERAL WATER POLLUTION CONTROL ACT CONCERNING PERMITS FOR DISPOSAL OF DREDGE OR FILL MATERIAL.
For primary bibliographic entry see Field 6E.
W76-07862

TO AMEND THE LAND AND WATER CONSERVATION FUND ACT OF 1965 AND TO AMEND THE HISTORIC PRESERVATION ACT OF 1966.
For primary bibliographic entry see Field 6E.
W76-07864

UNITED STATES V. BEATTY, INC. (GOVERNMENT RIGHT TO RECOVER EXPENSES FOR CLEANING UP OIL SPILLS),
For primary bibliographic entry see Field 6E.
W76-07870

UNITED STATES V. EUREKA PIPELINE CO. (PENALTY DETERMINATION UNDER FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W76-07871

UNITED STATES V. GENERAL MOTORS CORP. (CRIMINAL AND CIVIL PENALTIES FOR OIL DISCHARGE INTO NAVIGABLE WATERS).
For primary bibliographic entry see Field 6E.
W76-07872

STATE V. CALLAWAY (FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W76-07873

BOTSCH V LEIGH LAND COMPANY (ODORS FROM FEEDLOT LAGOON AS NUISANCE).
For primary bibliographic entry see Field 6E.
W76-07876

COMMONWEALTH DEPARTMENT OF ENVIRONMENTAL RESOURCES V METZGER (MAXIMUM LEVEL OF GROUND WATER AT LEAST FOUR FEET BENEATH EXCAVATION FOR SEWER).
For primary bibliographic entry see Field 6E.
W76-07881

COMMONWEALTH DEPT OF ENVIRONMENTAL RESOURCES V CITY OF LEBANON (IF FLUORIDATION NOT A PREREQUISITE FOR ISSUANCE OF WATER SUPPLY PERMIT, THEN CANNOT BE FOR MODIFICATION THEREOF).
For primary bibliographic entry see Field 6E.
W76-07883

LOVELADIES PROPERTY OWNERS ASS'N V. RAAB (FILING OF WETLANDS MAP PREREQUISITE TO REGULATION OF LANDS UNDER WETLANDS ACT OF 1970).
For primary bibliographic entry see Field 6E.
W76-07884

IN RE WILDLIFE WONDERLAND, INC. (VERMONT ENVIRONMENTAL BOARD FINDINGS OF POSSIBLE GAME FARM WATER POLLUTION ENOUGH TO DENY PERMIT).
For primary bibliographic entry see Field 6E.
W76-07886

COMMONWEALTH DEPARTMENT OF ENVIRONMENTAL RESOURCES V. FLEETWOOD BOROUGH AUTHORITY (CRIMINAL ASSESSMENT AGAINST BOROUGH FOR VIOLATION OF CLEAN STREAMS LAW).
For primary bibliographic entry see Field 6E.
W76-07887

COMMONWEALTH DEPARTMENT OF ENVIRONMENTAL RESOURCES V MONONGAHELA AND OHIO DREDGING COMPANY (INSURANCE OF CEASE AND DESIST ORDER TO DREDGING COMPANY WITHOUT A HEARING NOT A DENIAL OF DUE PROCESS).
For primary bibliographic entry see Field 6E.
W76-07888

CITY OF CONCORD V WATER SUPPLY AND POLLUTION CONTROL COMMISSION (ORDER TO COVER OPEN HIGH SERVICE DISTRIBUTION RESERVOIR NOT UNREASONABLE).
For primary bibliographic entry see Field 6E.
W76-07889

COMMONWEALTH DEPT. OF ENVIRONMENTAL RESOURCES V MILLS SERVICE, INC. (ABUSE OF DISCRETION BY ENVIRONMENTAL HEARING BD IN DETERMINATION OF POLLUTING PENALTY).
For primary bibliographic entry see Field 6E.
W76-07890

LEHAN V. COMMONWEALTH DEPT. OF TRANSPORTATION, (DISCHARGE OF WASTE MATERIALS ONTO LAND OWNER'S PROPERTY NOT A DEFACTO TAKING BY STATE).
For primary bibliographic entry see Field 6E.
W76-07891

AMERICAN MEAT INSTITUTE V. EPA 'EFFLUENT LIMITATIONS' ON SLAUGHTERHOUSES UNDER THE FEDERAL WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 6E.
W76-07907

NATURAL RESOURCES DEFENSE COUNCIL V. CALLAWAY (FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W76-07908

COMMONWEALTH V WASHINGTON TOWNSHIP (PA. CLEAN STREAMS LAW).
For primary bibliographic entry see Field 6E.
W76-07910

MOBIL OIL CORP. V. TOWN OF HUNTINGTON (CONSTITUTIONALITY OF OIL SPILLAGE ORDINANCE).
For primary bibliographic entry see Field 6E.
W76-07915

STATE DEPARTMENT OF ENVIRONMENTAL RESOURCES V METZGER (JUSTIFICATION OF SEWER REGULATIONS: MERE POSSIBILITY OF WATER POLLUTION).
For primary bibliographic entry see Field 6E.
W76-07919

LEHAN V STATE DEPARTMENT OF TRANSPORTATION (SEWAGE POLLUTION OF LANDOWNER'S WELL NOT A TAKING UNDER EMINENT DOMAIN CODE),
For primary bibliographic entry see Field 6E.
W76-07921

STATE DEPT. OF ENVIRONMENTAL PROTECTION V. JERSEY CENTRAL PWR AND LIGHT CO. (NO LIABILITY FOR DISCHARGE OF UNHEATED WATER INTO STREAM BECAUSE SUCH WATER NOT PROXIMATE CAUSE OF DEATH OF FISH),
For primary bibliographic entry see Field 6E.
W76-07923

POLLUTION: CONCEPT AND DEFINITION,
Australian National Univ., Canberra. Dept. of Forestry.
V. S. Russell.
Biol Conserv. 6(3), p 157-161, 1974.

Descriptors: *Pollution, Water quality, Water pollution, Air pollution, Soil pollution, Pollutant identification, *Classification, Waste identification.

The term 'pollution' is widely used and widely misunderstood. Definitions of the term are examined and alternatives suggested. Certain natural phenomena causing deterioration in the quality of water, air, or soil may be similar in their effects to some of man's activities. It is suggested that the term 'pollution' be restricted to certain human activities. Some of the implications of man's activities in the biosphere are examined.--Copyright 1974, Biological Abstracts, Inc.
W76-07955

SERUM CONSTITUENTS OF THE MALAYSIAN PRAWNS (MACROBRACHIUM ROSENBERGII) AND PINK SHRIMP (PENAEUS MARGINATUS),
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 5C.
W76-07966

BLOOD SUCKING DIPTERA OF THE VICINITY OF ABAKAN (KHAKASS AUTONOMOUS OBLAST OF KRASNOYARSK KRAI): I. THE SPECIFIC COMPOSITION AND BREEDING PLACES OF CULICIDAE, (IN RUSSIAN),
Institute of Medical Parasitology and Tropical Medicine, Moscow (USSR).
N. Ya. Markovich, and A. M. Proskuryakova.
Med Parazitol Parazit Bolezn 43(5), p 551-557, 1974.

Descriptors: *Diptera, *Mosquitoes, *Insect control, Water pollution control.
Identifiers: Abakan, Aedes-Behningi, Aedes-Caspius-Caspius, Aedes-Caspius, Dorsalis, Aedes-Cinerus, Aedes-Maculipennismesseae, Aedes-Strannheus, Aedes-Vexans-Nipponii, Culex-Modestus, Culex-Pipiens-Pipiens, Culicidae, Khakass, Krai, Oblast, *USSR(Krasnoyarsk region).

In the zone of insular steppes of the southern Krasnoyarsk region (USSR) mosquitoes represented by 26 spp. and subspecies were most prevalent among bloodsucking Diptera (Cluicidae). The dominant mosquitoes were of the genus Aedes, among them A. vexans nipponi; in the season of 1970, with high flooding, there were also A. cinereus and A. behningi. In the 2nd half of the summer in some areas of the territory there were numerous A. caspins dorsalis, A.c. caspius and A. Strannheus. Culex modestus and C. pipiens pipiens, frequently occurring in preimaginal stages in water bodies, were found only occasionally among mosquitoes attacking man. The main breeding places of mosquitoes were in the floodlands of the Enissey and the Abakan which were

hyperthermic most of the season. A. macullpennis messeae developed mainly in different streams and old river beds in the vicinity of the town.--Copyright 1975, Biological Abstracts, Inc.
W76-07988

RUBBER ROOF PROTECTS WATER FROM POLLUTANTS.
For primary bibliographic entry see Field 5F.
W76-08003

THE PRESENT CONDITION OF WATER POLLUTION AND THE FUTURE PROBLEMS (SUISHITSU ODAKU NO GENJO TO KONGO NO MONDAITEN),
Japan Environmental Agency, Tokyo.
For primary bibliographic entry see Field 5A.
W76-08007

STORM DRAINAGE 'FILTERED' BEFORE DISCHARGE,
B. Haro.
Public Works, Vol. 104, No. 9, p 124-125, September, 1973. 2 fig.

Descriptors: *Storm runoff, *Filtration, Streams, Watersheds(Basins), Urban runoff, Pipes, Trenches, Drainage systems, Drainage engineering, Drainage programs, Washington, Water pollution control.
Identifiers: Bellevue(Wash).

The growing demand for wider streets, parking areas, and other impervious surfaces has raised the question of preservation of natural streams and drainage basins in Bellevue, Washington. With this in mind, the Department of Public Works began investigation of methods to control its urban storm runoff problem. As an experimental approach during the design of a new municipal parking lot, the city decided to install what was nicknamed an 'environmental filter system'. The purpose of the system is to delay the runoff water in reaching the storm drainage system, reduce the amount of water entering the drainage system, and filter the runoff water. The filter system consists of two primary cross sections; a trench five feet wide and another two feet wide. In both cases, their depth is five feet, determined by the depth to the groundwater table. The section five feet wide receives runoff water from both sides, while the narrower section gets its water from only one side. At the catch basin where the perforated pipe meets the existing storm drainage system, the incoming invert is six inches below the outgoing invert. This forces the perforated pipe to remain partly full after the storm has passed and allows the system to redistribute the stored water back through the trench for maximum seepage into the adjacent soil. (Sandoski-FIRL)
W76-08032

A MULTI-OBJECTIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT USING GOAL PROGRAMMING,
McGill University, Montreal, Canada, Department of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 6G.
W76-08072

STORM DRAINAGE AND URBAN REGION FLOOD CONTROL PLANNING,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W76-08086

EQUITY CONSIDERATIONS IN CONTROLLING NONPOINT POLLUTION FROM AGRICULTURAL SOURCES,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
W. L. Miller, and J. H. Gill.
Water Resources Bulletin, Vol. 12, No. 2, p 253-261, April 1976. 3 tab, 12 ref.

Descriptors: *Water pollution control, *Agriculture, *Linear programming, *Farms, Size, *Economic impact, *Indiana, Constraints, Research, Mathematical models, Systems analysis, Water pollution sources.
Identifiers: *Nonpoint pollution sources, Net revenue maximization, Topographic areas, Soil loss standard, Tax subsidies.

The objectives of the research reported in this paper are: (1) to compare the relative economic impact on large and small farms of applying a statewide soil loss standard to achieve specified levels of pollution control as measured in tons of soil loss per acre per year; (2) to compare the relative impact between two different topographic areas in Indiana with respect to the statewide standard; and (3) to compare the relative economic impact between large and small farms and between different topographic areas resulting from application of taxes-subsidies on soil loss. Accomplishing these objectives will illuminate some of the equity consequences of application of two quite different approaches to controlling nonpoint pollution from agricultural sources. A linear programming model has been used to analyze the objectives. The model includes an objective function to maximize net revenue to the farm firm by selecting among a wide array of management practices applied on several different soil groups. It is concluded that the imposition of standard state soil loss rules has an unequal impact on the income of different size firms located in different topographic regions. (Bell-Cornell)
W76-08094

PUBLIC HEALTH ASPECT OF TROPICAL WATER RESOURCES DEVELOPMENT,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
N. Egbuniwe.
Water Resources Bulletin, Vol. 12, No. 2, p 393-398, April 1976. 27 ref.

Descriptors: *Water resources development, *Tropic, *Public health, *Diseases, Projects, Africa, Tennessee Valley Authority, *Water quality control.
Identifiers: *Nigeria(W Africa), *Developing countries, *Disease control.

The Governments of Nigeria have planned to build 395 dams in the next five years. Such water resources development may increase the incidence of Schistosomiasis, Malaria, Onchocerciasis, and Trypanosomiasis. Adequate measures need to be taken to minimize adverse effects of the projects on the public health. The proper preparation of reservoir sites before filling, the fluctuation of water levels and vegetation clearance that have been used successfully for mosquito control by the Tennessee Valley Authority should be tried by the Nigerian Authorities. The adverse effects on the public health may be prevented by designing the multiple-purpose projects to minimize the transmission of diseases and by providing in the budget for any water development project a fund to meet both recurrent costs and unforeseen problems concerned with the public health of the communities living around the project areas. (Bell-Cornell)
W76-08096

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIONS FOR COST SHARING: COST SHARING ISSUES--DIMENSIONS, CURRENT SITUATION AND OPTIONS.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6C.
W76-08035

A MULTI-OBJECTIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT USING GOAL PROGRAMMING,
McGill University, Montreal, Canada, Department of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 6G.
W76-08072

SEQUENCING TECHNIQUES FOR PROJECT SCREENING,
Havana University, Cuba, Centro de Investigaciones Hidraulicas.
J. B. M. Y. Rodriguez, and S. O. Russell.
Canadian Journal of Civil Engineering, Vol. 3, No. 1, p 90-97, March 1976. 1 fig, 6 tab, 8 ref, append.

Descriptors: *Projects, *Screening, *Methodology, *Optimization, *Planning, Demand, Water resources development, Water supply, Engineering, Algorithms, Costs, Mathematical models, Systems analysis.
Identifiers: *Sequencing, Cost minimization, Benefit maximization, Sensitivity tests.

Often in the early stages of planning a major development, it is necessary to consider a large number of alternative individual projects and alternative sequences of projects. The main problem at this stage is to screen out the less desirable projects quickly so that only a manageable number of the more promising ones remain for detailed study. A number of simple techniques are presented which can be used to assist the screening process. These include a method for finding the sequence of projects which will meet one or more projected demands at minimum discounted cost, and making a sensitivity test of the results; a method for finding the sequence of projects which would yield the maximum present value of benefits; and a way of finding the optimal planning horizon for facilities where there are economies of scale. A comparison is given between results obtained by the sequencing technique presented and results from a more rigorous but more elaborate and time consuming method for the case of multiple demands. The information and techniques presented herein could prove valuable to those involved in water resources development. (Bell-Cornell)
W76-08073

APPLICATION OF LINEAR PROGRAMMING OPTIMIZATION TO A NORTHERN ONTARIO HYDRO POWER SYSTEM,
Environment Canada, Ottawa, Ontario, Water Planning and Management Branch.
For primary bibliographic entry see Field 4A.
W76-08074

ANALYSIS OF MODELS FOR COMMERCIAL FISHING: MATHEMATICAL AND ECONOMICAL ASPECTS,
Cincinnati University, Ohio.
For primary bibliographic entry see Field 6C.
W76-08078

MULTIATTRIBUTE WATER RESOURCES DECISION MAKING,
Rockwell International, Anaheim, California, Autonetics Division.
For primary bibliographic entry see Field 6B.
W76-08079

A REALISTIC APPROACH TO RIVER BASIN DEVELOPMENT,
International Water Resources Association, New Delhi, India.
For primary bibliographic entry see Field 4A.
W76-08081

INTEGRATED DEVELOPMENT OF THE VARDAR/AXIOS RIVER BASIN,
United Nations, New York, N.Y.
For primary bibliographic entry see Field 4A.

W76-08082

AGGREGATE MODELING OF WATER DEMANDS FOR DEVELOPING COUNTRIES UTILIZING SOCIO-ECONOMIC GROWTH PATTERNS,
Oklahoma University, Norman, Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 6D.
W76-08083

SIZING FLOOD CONTROL RESERVOIR SYSTEMS BY SYSTEMS ANALYSIS,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W76-08085

METHODOLOGY FOR THE SELECTION AND TIMING OF WATER RESOURCES PROJECTS TO PROMOTE NATIONAL ECONOMIC DEVELOPMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-08091

OPTIMAL SIZING OF URBAN FLOOD CONTROL SYSTEMS,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W76-08092

PUBLIC HEALTH ASPECT OF TROPICAL WATER RESOURCES DEVELOPMENT,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-08096

PROBLEMS IN FORECASTING WATER REQUIREMENTS,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 6D.
W76-08098

A SIMULATION MODEL FOR OPERATING A MULTIPURPOSE MULTIRESERVOIR SYSTEM,
Acres Consulting Services Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 4A.
W76-08099

THE DEVELOPMENT OF WATER MULTIPLIER IMPACTS FROM INPUT-OUTPUT ANALYSIS: AN EMPIRICAL EXAMPLE FROM BOULDER, LARIMER, AND WELD COUNTIES, COLORADO,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 6D.
W76-08100

6B. Evaluation Process

WATER PROBLEMS AND RESEARCH NEEDS FOR HAWAII: 1975,
Hawaii Univ., Honolulu. Water Resources Research Center.
L. S. Lau.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-252 764, $5.00 in paper copy, $2.25 in microfiche. Technical Report No. 95, February 1976. 77 p, 15 ref, 3 append. OWRT B-039-HI (1) 14-31-0001-4011, 14-31-0001-5011.

Descriptors: *Regional analysis, *Regional development, Information dissemination, *Research priorities, *Hawaii, *Research and development.
Identifiers: Potential users, Technology transfer.

Because of their insular subtropic and volcanic environment, Hawaii and similar regions have special water problems and study needs not duplicated in the temperate continental region. Hawaii's water problems have also changed over past two decades as the economic base has progressed from a primarily agricultural existence to a mixture of urban-recreation-tourism, plantation agricultural, commercial-industrial, and military and governmental activities. Existing and emerging water problems and study needs have been identified for Hawaii in a 1974-1975 joint study by the Hawaii Water Resources Regional Study and the University of Hawaii's Water Resources Research Center. Among the nine water problem areas in water quantity water quality, environmental impact, and water planning and management, over 20 specific study needs have been identified. The historical and recent water study association and cooperation between Hawaii and other Pacific islands, including Guam, is described.
W76-07584

PUBLIC PERCEPTION OF POLLUTION CONTROL,
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07690

STRATEGIES FOR NATURAL RESOURCE DECISION MAKING: INTERIM REPORT TO THE NEW ENGLAND GOVERNOR'S CONFERENCE.
New England River Basins Commission, Boston, Mass.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 026, $3.50 in paper copy, $2.25 in microfiche. Report NERBC-002, December 6, 1972. 15 p.

Descriptors: *Regions, *New England, *Decision making, *Natural resources, *Watershed management, *Governmental interrelations, Programs, Water resources planning act, River Basin Commission, *Interstate rivers.
Identifiers: *New England River Basins Commission, Natural resource strategies.

This strategy recognizes the state as the dominant level of government, acting within the framework of national policies and assistance. The Federal government should establish policies and issue guidelines which interpret policies, offer technical assistance, foster regional cooperation, manage federal lands, and delegate responsibility to federal regional administrators to respond to unique characteristics of states. States should design overall natural resource strategies within state goals, serve as a focal point for monitoring performance of overall strategy and guiding political sub-divisions within the state in their decision making, assure access by local governments to state programs, and participate in interstate and region-wide contexts. Summarized recommendations are: (1) The New England Region should assure that regional interests are accounted for at state and federal levels by analyzing regional problems, advancing possible solutions, strengthening communications among various levels of government, and developing mechanisms to secure integration of natural resources decision making strategies. (2) The Commission should serve as a focal point for developing and refining regional strategies by coordinating various plans, preparing and updating a comprehensive regional plan and other plans. (3) The Commission is the appropriate agency for development of regional aspects of land use, coastal zone, water quality, and other natural resource programs. (4) This region should make appropriate use of other regional institutions to implement natural resources management programs. (5) The New England region should consider modifications of regional arrangements to increase desirable strategies for decision making. (Smith-North Carolina)
W76-07735

THE SCIENTIST AND DECISION MAKING AT LAKE TAHOE,
P. Meyer.
In: Proceedings: Lake Tahoe Research Seminar II, 27 September 1974, Sands Vagabond Convention Center, South Lake Tahoe, California, Report No. NSF/RA/G-74-012, p 23-33.

Descriptors: *Decision making, *Administration, *Management, *Planning, *Scientific personnel, Land use, Environment, Political aspects, Local governments, Governments.
Identifiers: *Lake Tahoe(Nev - Calif).

The Ward Valley Plan adopted by Placer County, Nevada, in 1970 was investigated in an attempt to determine the ways scientists influence the content of public policies. To gather data, 40 interviews were conducted, public documents were examined, and public hearings were attended. It was found that the suggestion to make a land-use plan for Ward Valley first came from the technicians on the county staff, who initially determined both the nature of the problem that faced the county and the general approach the county would take to solve it. After developing their proposal, the staff presented it to the planning commission and received permission to produce a plan. After gathering information, the staff drafted a plan without much direction from the commissioners or supervisors. The staff presented their plan at public hearings. It was the only such plan presented; no one besides the staff had invested the time and energy to produce a detailed plan for the Valley. Consequently, the county politicians had no respectable alternative, and the Board of Supervisors simply adopted the plan recommended by the staff. The influence of academic scientists on the Ward Valley Plan was very gradual and unrecognized and occurred over a number of years prior to the staff's work. (See also W76-07793) (Sims - ISWS)
W76-07795

SEQUENCING TECHNIQUES FOR PROJECT SCREENING,
Havana University, Cuba, Centro de Investigaciones Hidraulicas.
For primary bibliographic entry see Field 6A.
W76-08073

MULTIATTRIBUTE WATER RESOURCES DECISION MAKING,
Rockwell International, Anaheim, California, Autonetics Division.
J. H. Dean, and C. S. Shih.
AIIE Transactions, Vol. 7, No. 4, p 408-413, December 1975. 5 fig, 8 ref.

Descriptors: *Water resources development, *Decision making, *Alternative planning, Reservoirs, Evaluation Simulation analysis, Monte Carlo methods, Economics, Social aspects, Systems analysis, Texas.
Identifiers: *San Angelo(Texas), Multiattribute utility theory, Sensitivity analysis.

Field reconnaissance with decision makers in San Angelo, Texas led to the selection of dependability, environmental degradation, economic growth potential, quantity, quality, cost, social acceptance and flexibility as the important attributes to be considered in their supplementary water resource development decision problem. The application of multiattribute utility to this problem is discussed and a sensitivity analysis embedded

with Monte-Carlo simulation for the ranking of alternatives is presented. The importance of different considerations other than monetary effects is fully demonstrated and integrated in the final decision-making for water resources development. From the San Angelo case study, it may be concluded that monetary consideration can easily be outweighted by other considerations. Multiattribute utility theory can provide a framework of quantitative analysis for decisions involving both tangible and intangible factors. A sensitivity analysis embedded with Monte-Carlo simulation can add extra dimension of reliability to utility assessments. Finally, decision analysis offers an explicit medium of communication to pool the concensus of judgments from a group of decision makers. (Bell-Cornell)
W76-08079

PROBLEMS OF REESTABLISHING COMMERCIAL RECREATION BUSINESSES IN NEW YORK FOLLOWING HURRICANE AGNES,
New York State Coll. of Agriculture and Life Sciences, Ithaca.
For primary bibliographic entry see Field 6F.
W76-08089

METHODOLOGY FOR THE SELECTION AND TIMING OF WATER RESOURCES PROJECTS TO PROMOTE NATIONAL ECONOMIC DEVELOPMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
W-A. Lemma.
No. 77, Hydrology Papers, August 1975. 60 p, 7 fig, 11 tab, 79 ref, 3 append.

Descriptors: *Water resources, *Projects, *Timing, *Methodology, Analytical techniques, Input-output analysis, Simulation analysis, Economic efficiency, Demand, Assessment, Optimization, Cost-benefit ratio, Computer programs, Planning, Mathematical models, Systems analysis.

Developed is a methodology, designed to facilitate the selection and timing of water resources projects to optimally achieve 'a priori' specified national economic development through desired strategies. The methodology is composed of several analytical procedures. An input-output model is used to simulate the national economy, thus further facilitating consistent projections of the elements of final demands in accordance with the national economic development objectives and strategies, and assessing the total and incremental requirements for sectoral outputs of goods and services at designated future time periods. A mathematical model for the selection and timing of water resources projects for their implementation (for the formulation of an optimal national water resources development program) has been developed and its application demonstrated on an example problem. The model incorporates important factors such as economic efficiency of projects, demand targets for project outputs of goods and services necessary to achieve desired national economic growth, resources capabilities and limitations, and project interrelationships. Incorporation of these and other related factors makes the model reflective of the real world problem it is intended to aid in solving. Application of the model to an example problem indicates it to be very useful in the national economic planning process. Further avenues for research and improvement are also revealed. (Bell-Cornell)
W76-08091

AN EXPLORATORY SURVEY AND ANALYSIS OF SAILING IN GALVESTON BAY, TEXAS,
Texas A and M Univ., College Station. Coll. of Agriculture.
R. Jarman, and R. B. Ditton.
Water Resources Bulletin, Vol. 12, No. 2, p 399-413, April 1976. 2 fig, 6 tab, 12 ref.

Descriptors: *Boating, Facilities, *Recreation, *Research, Methodology, Water resources, *Texas.
Identifiers: *Sailing, Use patterns, *Galveston Bay(Tex), Boating experience, Geographic patterns, Sailing participation.

Participation in sailing has increased dramatically over the past fifteen years. During some periods, the growth in sailing participation has actually exceeded that of other forms of recreational boating. Although increased sailing activity has exerted pressure for policy and facility development, our understanding of sailing is limited. The lack of baseline information systems may be a major reason for the absence of sailing research efforts. The purpose of this paper is to describe the findings of an exploratory survey of sailing in Galveston Bay, Texas. Included are findings on the descriptive characteristics, boat ownership, sailing experience, extent and nature of sailing participation and geographic patterns of sailing of a group of sailing participants in Galveston Bay. Although exploratory in nature, this survey provides an increased understanding of sailing activities as well as difficulties involved in obtaining data. (Bell-Cornell)
W76-08095

A SYSTEM FOR EVALUATING SCENIC RIVERS,
Purdue Univ., Lafayette, Ind. Dept. of Forestry.
D. M. Knudson.
Water Resources Bulletin, Vol. 12, No. 2, p 281-289, April 1976. 2 tab, 7 ref.

Descriptors: *Evaluation, *Streams, Rivers, *Indiana, *Aesthetics, Water quality, Roads, Banks, Vegetation, Methodology.
Identifiers: *Scenic rivers, Rating.

A system is presented for evaluating streams for inclusion in 'scenic river' systems. Rating criteria are proposed which are objective and pertinent to recreational, scenic, and natural qualities of the river and its banks. The criteria should also be selected for simplicity and economy in application. Numerical ratings of eight criteria are shown for Indiana conditions. These were applied to streams meeting minimum qualifications. The rating criteria are measures of bank vegetation, stream course alterations, man-made structures and roads near and across the river, aesthetic quality of the water, and special natural features. (Bell-Cornell)
W76-08097

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF PARATHION.
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5G.
W76-07612

GENERAL CONSIDERATIONS ON THE CONDITIONS OF THE ADMISSION OF INDUSTRIAL EFFLUENTS INTO WASTE WATER TREATMENT PLANTS FOR TREATMENT TOGETHER WITH URBAN WASTE WATERS, AND ON THE CONTRIBUTIONS BY THE INDUSTRIES TOWARD THE TREATMENT COSTS (VUE GENERALE SUR LES CONDITIONS D'ADMISSION DES EFFLUENTS INDUSTRIELS DANS LES STATIONS D'EQUATION, POUR TRAITEMENT EN MELANGE AVEC LES EAUX USEES URABAINES, ET SUR LA PARTICIPATION INDUSTRIELLE AU COUT DE CE TRAITEMENT),
For primary bibliographic entry see Field 5D.
W76-07634

THE WATER AND TOTAL OPTIMIZATIONS OF WET AND DRY-WET COOLING TOWERS FOR ELECTRIC POWER PLANTS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 3E.
W76-07674

TWO TRILLION OR THREE: THE COST OF WATER QUALITY GOALS,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5G.
W76-07686

COST EFFECTIVENESS OF REGIONAL WATER QUALITY MANAGEMENT: SOME SELECTED CASE STUDIES AND GENERAL IMPLICATIONS,
Manhattan Coll., Bronx, N. Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-07687

FINANCING AND CHARGES FOR WASTEWATER SYSTEMS: ACTIVITIES OF THE JOINT WPCF/ASCE/APWA COMMITTEE,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 5G.
W76-07689

THE IMPACT OF LARGE TEMPORARY RATE CHANGES ON RESIDENTIAL WATER USE,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Dept. of Economics.
For primary bibliographic entry see Field 6D.
W76-07738

METHODS AND COSTS OF INDUSTRIAL EFFLUENT TREATMENT,
Ciba-Geigy Limited, Duxford, Cambridge, Environmental Technical Services Group.
For primary bibliographic entry see Field 5D.
W76-07740

THE INTERPLAY OF LAW AND TECHNOLOGY IN DEEP SEABED MINING ISSUES,
Alfred P. Sloan School of Management, Cambridge, Mass.
For primary bibliographic entry see Field 6E.
W76-07816

DREDGING ON THE MISSOURI RIVER OXBOW LAKES.
For primary bibliographic entry see Field 6E.
W76-07867

SEWAGE PLANT USES NATURAL FEATURES TO CUT COSTS.
For primary bibliographic entry see Field 5D.
W76-08033

OPTIONS FOR COST SHARING: COST SHARING ISSUES--DIMENSIONS, CURRENT SITUATION AND OPTIONS.
Water Resources Council, Washington, D.C.
Part 5A. Planning and Cost Sharing Policy Options for Water and Related Land Programs, September 1975. 204 p. 5 fig., 13 tab., 5 append.

Descriptors: *Cost sharing, *Federal project policy, *Equity, Model studies, Government finance, Local governments, Water users, Reimbursable costs, Cost allocation, Cost repayment.

A statement of cost sharing principles is developed from which the appropriate policies for various national objectives may be formulated. Postulated are the basic reasons and the many options for

non-federal cost sharing for water and other natural resources with some judgments on the practicable levels of cost sharing and especially, the financing alternatives. The focus is on the issues for cost sharing defined as: (1) How should water resources projects and programs be financed; (2) who should pay; and (3) what are the appropriate payment terms and conditions for non-federal interests. Three options are developed to provide consistent and equivalent answers. Each option is evaluated with respect to its operations feasibility and its impact on relevant objectives, purposes and program levels. The probable impacts of various cost sharing options and the resulting federal/non-federal shares are judged on: (a) Non-federal willingness and ability to participate; (b) the overall effectiveness in meeting users' needs; (c) satisfying regional and national objectives; and (d) maintaining the longer run integrity of federally-assisted programs for the long-range national needs. A model illustrates an approach by which one can subjectively determine on the fairness principle, what an alternative cost sharing policy should be, and to approximate the various impacts which would result with respect to the federal and non-federal cost shares for each purpose. (Auen-Wisconsin)
W76-08035

NEKTON POPULATION DYNAMICS IN THE ALBEMARLE SOUND AND NEUSE RIVER ESTUARIES,
North Carolina Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-08037

ANALYSIS OF MODELS FOR COMMERCIAL FISHING: MATHEMATICAL AND ECONOMICAL ASPECTS,
Cincinnati University, Ohio.
A. Leung, and A-Y Wang.
Econometrica, Vol. 44, No. 2, p 295-303, March 1976. 6 fig, 10 ref.

Descriptors: *Commercial fishing, *Mathematical models, *Economics, *Ecology, Fish, Capital, Investment, Prices, Technology, Equations, Systems analysis.
Identifiers: Lemmas, Equilibrium position.

Dynamic models for commercial fishing have been proposed by various economists in recent years. There is need for a better understanding of the behavior of the dynamic system and of the effect of different parameters. Such knowledge is necessary for forecasting economic trends and for developing procedures to stabilize fish population and economic movement. This paper investigates a simple economic model for the commercial fishing industry. The model is restricted to non-time-lag investment decisions and to the simplest biological equation. Results imply the phenomena of non-explosive fishing capital investment and non-extinctive fishery resources. Both investments and resources will always tend to an equilibrium position. A comparison with a more general model is also made. (Bell-Cornell)
W76-08078

6D. Water Demand

PERSPECTIVE ON USE OF FRESH WATER FOR COOLING SYSTEMS OF THERMOELECTRIC POWERPLANTS IN FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 3E.
W76-07596

THE IMPACT OF LARGE TEMPORARY RATE CHANGES ON RESIDENTIAL WATER USE,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Dept. of Economics.
T. F. Hogarty, and R. J. Mackay.
Water Resources Research, Vol. 11, No. 6, p 791-794, December 1975. 2 tab.

Descriptors: *Income effects, *Asymmetry, *Water rates, *Water use, *Elasticity of demand, *Marginal costs, Substitution effects, *Water demand.
Identifiers: Arc price elasticity, Mean elasticity.

Recent studies have concluded water use was unresponsive to rate changes in the short run, with any adjustments occurring, if at all, only in the long run. And it was noted that reduction in domestic water use consisted primarily of repairing leaks. However, this paper indicates that (1) residences curtail total and domestic use of water if marginal rates increase significantly; (2) reduction in water usage may be as great in the short run (e.g. 3 months) as in the long run (e.g. 1 year); (3) reduction in water use following a large rate increase is to some extent permanent. The raw data for the study was compiled from monthly water bills at 120 individually owned townhouses in Blacksburg, Virginia. Quarterly averages were used due to unreliable data. Using marginal rates, arc price elasticity estimates were determined for each household. Od bserved results from the data were: (1) residential water consumption, even for domestic use, is highly sensitive to large increases in (marginal) rates; (2) response to rate increases is as great in the short run as in the longer period; (3) residential water consumption, at least for domestic use, is relatively insensitive to decreases in (marginal) rates following large increases. Income effects, substitution effects and asymmetry (more sensitivity to rate increases than to decreases) are discussed in the analysis. (Gentry-North Carolina)
W76-07738

MIXING OIL AND WATER: THE EFFECT OF PREVAILING WATER LAW DOCTRINES ON OIL SHALE DEVELOPMENT,
Kutak, Rock, Cohen, Campbell, Garfinkle and Woodward, Omaha, Nebr.
For primary bibliographic entry see Field 6E.
W76-07806

TO AMEND THE LAND AND WATER CONSERVATION FUND ACT OF 1965 AND TO AMEND THE HISTORIC PRESERVATION ACT OF 1966.
For primary bibliographic entry see Field 6E.
W76-07864

AGGREGATE MODELING OF WATER DEMANDS FOR DEVELOPING COUNTRIES UTILIZING SOCIO-ECONOMIC GROWTH PATTERNS,
Oklahoma University, Norman, Bureau of Water and Environmental Resources Research.
G. W. Reid, and M. I. Muiga.
Working Paper No. 48, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 21 p, 1 fig, 2 tab, 2 append.

Descriptors: *Water demand, *Social aspects, *Economics, *Water resources development, Management, Riverbasins, Methodology, Comprehensive planning, Water treatment, Industrial water, Municipal water, Water supply, Equations, Systems analysis, Mathematical models.
Identifiers: *Developing countries, Growth patterns(Socio-economic), Aggregate model, Agricultural water.

An aggregate model has been developed, the basic input of which is the sixteen socio-economic parameters representing data that is generally available at a national or basin level in developing countries. The socio-economic inputs identify four activity socio-technological levels, levels representative of status of socio-economic development are in turn used to identify municipal, agricultural and industrial gross water requirements. The normalized requirements and the normalized resource capabilities in terms of water, energy, aerable land, metals and petrochemicals are used as constraints on the projective system. The output or planning level information on total and three basic categorical water requirements that are in balance with the socio-economic growth of developing countries is derived. It is important that this type of model be continuously brought up to date. Data should be collected periodically to be used for validation of the model. Currently, data, especially that for industrial and irrigation water demand, are being collected from developing countries in Africa, Asia, and South America. (Bell-Cornell)
W76-08083

PROBLEMS IN FORECASTING WATER REQUIREMENTS,
Research Inst. for Water Resources Development, Budapest (Hungary).
M. Domokos, J. Weber, and L. Duckstein.
Water Resources Bulletin, Vol. 12, No. 2, p 263-275, April 1976. 1 fig, 62 ref.

Descriptors: *Water requirements, *Statistical methods, *Forecasting, Time series analysis, Social aspects, Economics, Water allocation(Policy), Methodology, Systems analysis, Mathematical models.
Identifiers: *Long-range predictions, *Multiple regression analysis.

Methodological problems associated with forecasting water requirements by use of regression analysis are examined. Problems occurring when long-range forecasts are based on linear and nonlinear extrapolation of time series models include possible changes in socioeconomic conditions, water allocation system structure, and limits to growth. Problems arising in forecasting based on multiple regression models are likely to involve serially dependent errors, multicollinear explanatory variables, and difficulties inherent to the presence of explanatory variables that must themselves be predicted. (Bell-Cornell)
W76-08098

THE DEVELOPMENT OF WATER MULTIPLIER IMPACTS FROM INPUT-OUTPUT ANALYSIS: AN EMPIRICAL EXAMPLE FROM BOULDER, LARIMER, AND WELD COUNTIES, COLORADO,
Colorado State Univ., Fort Collins. Dept. of Economics.
S. L. Gray, and J. R. McKean.
Water Resources Research, Vol. 12, No. 2, p 135-140, April 1976. 7 tab, 10 ref.

Descriptors: *Water utilization, *Input-output analysis, *Leontief models, *Economics, Estimating, Water demand, Planning, Water supply, Equations, Mathematical models, Systems analysis, *Colorado.
Identifiers: *Water intake, *Consumptive use, Regional economy.

The relationship between economic activity in a regional economy and water intake and consumptive use requirements is investigated by using the Leontief model. Estimates of direct and indirect water requirements for the regional economy are developed and are applied to three distinct planning questions: estimated aggregate water use in the regional economy, estimated sector by sector water requirements in response to total projected changes in final demands, and estimated changes in water requirements in the regional economy given a change in a single sector's deliveries to final demand. (Bell-Cornell)
W76-08100

6E. Water Law and Institutions

PROCEEDINGS: SECOND WETLANDS CONFERENCE (HELD ON JANUARY 9, 1974 AT STORRS, CONNECTICUT),
Connecticut Univ., Storrs. Inst. of Water Resources.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-252 753, $6.00 in paper copy, $2.25 in microfiche. Report No. 24, October 1975. 118 p, 14 fig, 1 tab, 3 append. M. W. Lefor, H. H. Ridgeway, T. B. Helfgott, eds. OWRT-B-010-CONN(1), 14-31-0001-5062.

Descriptors: *Wetlands, *Legal aspects, *Political aspects, Soil surveys, Remote sensing, Land use, Boundaries(Property), Economics, Constitutional law.
Identifiers: *Wetlands definition, *Environmental aspects, *Public policy, Thematic maps, The Taking Clause, Connecticut Inland Wetlands Act.

Under the theme of inland wetland conservation, seven edited and reviewed papers concerned with environmental and political science aspects of delineation of wetlands are presented. The conference was held on January 9, 1974, sponsored by the Institute of Water Resources at the University of Connecticut and co-sponsored by the Connecticut State Department of Environmental Protection and the U.S. Soil Conservation Service. The major topics covered are: the identification of freshwater wetland values; methods of delineating wetlands by means of soil surveys; considerations in the preparation of specialized maps; the use of remote sensing in setting criteria for the management of inland wetlands; practical aspects of field determination of wetland boundaries; public policy implications of inland wetlands and water courses laws; and a legal and constitutional discussion on The Taking Issue as it relates to current Acts. The proceedings include specific information and conclusions on these issues as well as illustrations such as maps, reference lists, appendices of Latin and common botanical species names for wetland plants, the National Map Accuracy Standards and a list of conference participants. The proceedings are devoted to the consideration of wetlands for the long-term environmental value of these water and land resources. (deLara-Connecticut)
W76-07451

WATER RESOURCES ISSUES AND THE 1972 UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-07688

STRATEGIES FOR NATURAL RESOURCE DECISION MAKING: INTERIM REPORT TO THE NEW ENGLAND GOVERNOR'S CONFERENCE.
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6B.
W76-07735

WILL INDUSTRY MEET WATER QUALITY REQUIREMENTS,
For primary bibliographic entry see Field 5G.
W76-07736

PROPOSED KAIPAROWITS PROJECT, FINAL ENVIRONMENTAL IMPACT STATEMENT.
For primary bibliographic entry see Field 6G.
W76-07800

NEBRASKA DISPOSAL WELLS REGULATIONS.
Nebraska State Dept. of Environmental Control, Lincoln.
For primary bibliographic entry see Field 5G.
W76-07801

REGISTRATION OF LIQUID WASTE HAULERS AND WASTE DISPOSAL TO LAND,
For primary bibliographic entry see Field 5G.
W76-07802

MODELS FOR IMPLEMENTING THE CZMA'S CONCEPT OF STATE-LOCAL RELATIONS,
Nassau-Suffolk Regional Planning Board, N. Y.
L. E. Koppleman.
William and Mary Law Review, Vol. 16, No. 4, p. 731-46 (1975). 16 p, 3 fig.

Descriptors: *Administrative agencies, *State governments, *Comprehensive planning, *Coastal engineering, *Water management(Applied), Coastal marshes, Coastal plains, Water control, Local governments, Water law, Water policy, Water conservation, State jurisdiction, Planning, Management, Optimization, Decision making, Land management, Marsh management, Coordination, Systems analysis, Project planning, Political aspects.
Identifiers: *Coastal Zone Management Act, Coastal zone management, Coastal waters.

Evaluated in this article are various governmental structures which could be used to manage the coastal zone. The Coastal Zone Management Act encourages the development of such structures by requiring participating states to include comprehensive management plans describing the governmental unit which will administer the program and the methods chosen. Local regulation in accordance with state-established standards and local regulation subject to state review are two options available to the states. Any plan adopted must also be weighed in light of political considerations because of the prevalent 'home rule' practice of states. The states are responsible for the development of criteria and guidelines to be used by local governments whichever model of coastal zone planning is chosen. Since effective planning requires extensive research so that rational control can be accomplished, interim provisions, such as consolidation of all existing legislation or regulatory proceedings into a single measure, should be implemented until a comprehensive plan can be adopted. Regulation by local governmental units can achieve coordinated management of coastal zones if multi-state cooperation can produce effective and comprehensive guidelines. (Welch-Florida)
W76-07803

COASTAL BOUNDARY LITIGATION WITH THE STATE: A FRAME OF REFERENCE,
Florida State Dept. of Environmental Regulation, Tallahassee.
R. A. McVoy.
Florida Bar Journal, Vol. 49, No. 10, 579-84 (1975). 6p.

Descriptors: *Elevation, *Boundaries(Property), *Boundary disputes, *High water mark, *Coasts, Water law, Legal aspects, Meanders, Tides, Tidal waters, Bodies of water, Tidal marshes, Legal review.
Identifiers: *Extrapolated water elevation, *Meander line.

When reviewing abstracts of coastal lands, it is important to remember that private title generally extends only to the mean high water line. The procedures for demarcation of the mean high water line are set forth in Florida State Board of Professional Engineers and Land Surveyors. Several techniques are available in determining the line, such as the extrapolated water elevation method and the control tide station method. Problems often arise, however, which make it impossible for a surveyor to locate the mean high water line. In such cases, a judicial determination should be sought that will recognize some other line as the legal boundary line. In one important Florida decision, it was held that the meander line constituted the legal boundary line. Whether that case reached a valid decision is questionable since meander lines are often found to cut into upland areas in some place and into open water in others. Several other Florida cases suggest that ebb and flow concepts might be preferable in determining boundary lines, but these cases too are open to doubt. Consequently, numerous factors must be considered in determining the legal boundary line of a client's coastal property. (Hoffman-Florida)
W76-07804

PROPERTY TAX LAWS OF TEXAS,
J. D. Howell, Jr.
Texas Real Estate Research Center, College Station, 1975, 90 p. $1.00.

Descriptors: *Texas, *Taxes, *Legislation, *Water resources, *Constitutional law, Legal aspects, Assessments, Conservation, Gulf of Mexico, Local governments, Water districts, Coastal structures, Sea walls, Breakwaters, Ferry boats, Bridges.
Identifiers: *Ad valorem taxes, Property taxes.

This booklet presents a simplified view of the laws and procedures involved in administering the ad valorem property tax in Texas. Tax provisions relating to water districts are touched on briefly. The appendix contains the constitutional provisions pertaining to property taxation. The sections concerned with water resources include: (1) Article 111, dealing with legislation relating to ferries and bridges; (2) Article X1, Section 7, permitting counties and cities on the Gulf of Mexico to levy property taxes for the construction of seawalls, breakwaters or sanitary purposes; and (3) Article XV1, Section 59, providing for the creation of conservation and reclamation districts for the purpose of conserving and developing all of the natural resources of the state. (Capehart-Florida)
W76-07805

MIXING OIL AND WATER: THE EFFECT OF PREVAILING WATER LAW DOCTRINES ON OIL SHALE DEVELOPMENT,
Kutak, Rock, Cohen, Campbell, Garfinkle and Woodward, Omaha, Nebr.
W. E. Holland.
Denver Law Journal, Vol. 52, No. 3, p. 657-94 (1975). 38 p, 2 map, append.

Descriptors: *Colorado, *Oil shales, *Water supply, *Mineral industry, *Water allocation(Policy), Water resources, Water rights, Oil, Water law, Appropriation, Beneficial use, Groundwater, Surface waters, Prior appropriation, Priorities, Preferences(Water rights), Water delivery, Federal government, Federal jurisdiction, Federal reservations, National forests, Utah, Wyoming.
Identifiers: *Green River Formation, 'Law of the river.'

The Green River Formation underlying several basin areas in Colorado, Utah, and Wyoming is the most commercially significant oil shale formation in the world. No shale oil has yet been produced, however, due to difficulties in separating the oil from the rock and in acquiring a sufficient water supply. As to the water supply, natural limits are not the source of the problem. The Colorado River Compact, the Mexican Water Treaty, and the Upper Colorado River Basin Compact artificially limit availability of water supplies in the oil shale areas. In addition ground waters and surface waters are considered public property and thus are subject to allocation through prior appropriation systems in the shale oil states. Consequently,

water for production purposes can be acquired only by acquiring existing appropriation rights or by filing applications for unappropriated water. The filing of applications also has problems, though, for state laws give preference for certain uses of water. The ultimate solution may be a system whereby water delivery rights can be purchased analogous to contract rights for utilities. Another potential solution involves the doctrine of federal reserved rights whereby the oil industry could possibly obtain water supplies on lands otherwise reserved for naval oil shale reserves, national forests and Indian Reservations. (Hadoulias-Florida)
W76-07806

ISSUES TO BE RESOLVED IN THE SECOND SUBSTANTIVE SESSION OF THE THIRD UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA,
Department of State, Washington, D. C. Office of the Assistant Legal Adviser for Ocean Affairs.
B. H. Oxman, and M. B. West.
Columbia Journal of Transnational Law, Vol. 14, No. 1, p. 87-101 (1975).

Descriptors: *United Nations, *International waters, *International law, *Law of the sea, *Continental shelf, United States, Navigation, Navigable waters, Military aspects, Oceans, Water policy, Reasonable use, Marine fisheries, Fishing, Migration, Commercial fisheries, Legal aspects, Water law, International law, Foreign waters, Continental margin, Straits, Commercial fishing.
Identifiers: *Deep seabed mining, United Nations Conference on the Law of the Sea(UNCLOS), Territorial seas, International navigation, Deep seabed resources.

Three committees were charged with resolution of the various issues facing the second substantive session of the Third United Nations Conference on the Law of the Sea. Issues relating to deep seabed resources were charged to Committee 1, navigation and resources other than deep seabed resources to Committee 11, and issues centered around pollution and scientific research to Committee 111. Previous sessions of Committee 1 have resulted in strong political and ideological confrontations among nations whose interests differ in the matter of deep seabed mining. In comparison, Committee 11 has reached substantial agreement on major jurisdictional questions related to 12-mile territorial seas and 200-mile economic zones. Committee 111, however, has to date failed to produce a text on some major pollution concerns, and has not resolved some basic questions involving scientific research. All three committees face the need for designing a satisfactory dispute settling mechanism which will result in binding decisions when other means of settlement fail. The authors outline in detail the major problem areas faced by the Conference. (Sloan-Florida)
W76-07807

APPLICATION OF THE WINTERS DOCTRINE: QUANTIFICATION OF THE MADISON FORMATION,
M. M. Hickey.
South Dakota Law Review, Vol. 121, No. 1, p. 144-59 (1976). 16 p.

Descriptors: *South Dakota, *Indian reservations, *Preferences(Water rights), *Federal-State water rights conflicts, *Aquifers, Groundwater, Groundwater resources, Aquifer management, Water rights, Irrigation, Water demand, Water management(Applied), Water users, Water requirements.
Identifiers: *Winters doctrine.

As the population of South Dakota grows and existing surface water supplies decrease, groundwater becomes increasingly important as an alternative source of supply. However, the state's development of its abundant sources of groundwater is tempered by the rights of the Indians as provided in the Winters Doctrine. The Doctrine derives its name from the case Winters v. United States, 207 U.S. 564 (1908), and provides that whenever the United States by treaty, act of Congress or executive order, reserves and withdraws a portion of land from the public domain for a federal purpose which will ultimately require water, absent an intent otherwise, a sufficient amount of water to accomplish that purpose is reserved. This article examines the application of the Winters Doctrine to the subsurface waters of the Madison Formation, a large aquifer in South Dakota. It also discusses various methods of quantifying Indian rights to those waters by virtue of the Doctrine. The article concludes with a discussion of the effect of the proposed National Water Rights Procedures Act on the Winters Doctrine and appeals for a balancing of rights to water supplies between Indian and non-Indian competitors. (Lasris-Florida)
W76-07808

ENVIRONMENTAL LAW: WHAT IS 'MAJOR' IN 'MAJOR FEDERAL ACTION', MINNESOTA PUBLIC INTEREST RESEARCH GROUP V. BUTZ, 498 F2D 1314 (8TH CIR. 1974).
Washington University Law Quarterly, Vol. 1975, No. 2, p. 485-94. 10 p.

Descriptors: *Legal review, *Administrative agencies, *Federal government, *Standards, *Permits, Legal aspects, Judicial decisions, Environmental effects, Regulation, Forest management, Lumbering, *Minnesota, Dams, Road construction, Watershed management, Construction, Electric power plants.
Identifiers: *National Environmental Policy Act, Administrative regulations, Environmental impact statement.

The trend in the federal court system appears to be toward a careful judicial scrutiny of an agency's decision not to prepare an environmental impact statement (EIS). The author examines the various methods used by the courts to determine whether a federal action is major and significant within the coverage of the National Environmental Policy Act (NEPA). The methods frequently lead to inconsistent results. Cases in which the courts have consistently found agency action to require an EIS include highway construction, dams and watershed projects, electric power projects and building construction. The author examines Minnesota Public Interest Research Group V. Butz, and Eighth Circuit Court of Appeals decision which enjoined logging operations in the Boundary waters Canoe Area until the United States Forest Service could file an environmental impact statement. He concludes that the case is consistent with the judicial view of NEPA as an 'environmental full-disclosure law'. (Capehart-Florida)
W76-07809

PROPERTY--SUSCEPTIBILITY OF BEDS OF NAVIGABLE WATERS TO PRIVATE OWNERSHIP,
S. H. Kupperman.
Tulane Law Review, Vol. 50, No. 1, p. 193-200 (1975). 8 p.

Descriptors: *Land tenure, *Louisiana, *Ownership of beds, *Navigable waters, *Royalties, Beds,Judicial decisions, Legal review, Legal aspects, Compensation, Cost repayment, Prior appropriation, Public lands, State governments.
Identifiers: Public trust doctrine, Mineral rights.

The present position of the Louisiana Supreme Court is that the beds of all navigable waterways within the state are and always have been completely insusceptible of private ownership. This position overrules prior Louisiana case law and is likely to provoke further litigation to determine the rights of private parties claiming ownership. Individuals who previously had valid claims of ownership may have a right to reimbursement. The author discusses the additional problem of whether the owners of the mineral rights have any further claim on royalty payments from submerged properties. (Capehart-Florida).
W76-07810

STATE RESPONSIBILITY AND THE LAW OF INTERNATIONAL WATERCOURSES,
Lewis Univ., Lockport, Ill. Coll. of Law.
T. O. Holstein.
Lawyer of the Americas, Vol. 7, No. 3, p. 535-55 (1975). 21 p.

Descriptors: *International law, *Navigable waters, *Governmental interrelations, *Oil pollution, *Oil spills, Water pollution, Legal aspects, Treaties, International waters, Rivers, Navigable rivers, River systems, Watersheds(Basins), River basins, Water pollution effects, Political aspects, United Nations, Governments, Legislation, Watercourses(Legal aspects), Foreign countries.

The International Law Commission of the United Nations is studying the law of non-navigational uses of international waterways with a view to its development and codification. In general the area of non-navigational uses includes state responsibility for extra-territorial injury caused by the pollution of international rivers. The author examines various methods of creating state responsibility for extra-territorial injury. Treaties generally are ineffective. However, since treaties creating objective regimes have a greater authority to bind non-signatory states than most multi-lateral treaties, they may be uniquely suited to deal with pollution of international watercourses. The author concludes that the Commission should limit its codification of international watercourses to specific non-navigational uses. Since pollution is not a use but the result of use, state responsibility for pollution should be included in the codification of general state responsibility. (Capehart-Florida).
W76-07811

OIL TANKER POLLUTION CONTROL: DESIGN CRITERIA VS EFFECTIVE LIABILITY ASSESSMENT,
Department of the Treasury, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07812

THE REGULATION OF DEEPWATER PORTS,
For primary bibliographic entry see Field 5G.
W76-07813

INTERNATIONAL SEABED RESOURCES: THE U. S. POSITION,
D. C. Ohly.
Virginia Journal of International Law, Vol. 15, No. 4, p 903-25, (1975) 23 p.

Descriptors: *Exploitation, *Continental shelf, *International Law, *Law of the sea, *Mineral industry, Mining, Manganese, Exploration, Cobalt, Copper, Nickel, Navigation, Metals, Mineralogy, Resources, Resource development, Oceans, International waters, Foreign waters, Treaties, United Nations, United States.
Identifiers: *Deep seabed mining, Territorial sea, United Nations Conference on the Law of the Sea(UNCLOS), Mineral nodules, Marine resources, Developed countries, Developing countries.

One of the motivating factors, for convening the Law of the Sea Conference was the assertion and threatened future assertion of national claims of functional or territorial jurisdiction over large ocean areas for the purpose of mineral exploitation. This jurisdictional issue has caused a direct conflict between the developed and developing countries. Nations possessing high technology in-

dustries, with a consequent need for minerals found on the deep seabed, are faced with pressure unilaterally to exploit these mine beds. Developing nations, on the other hand, are concerned that their access to mine sites will be foreclosed by their present technological incapacities. In an attempt to resolve this conflict, the United Nations Law of the Sea Conference is considering the creation of an International Seabed Authority to regulate the mining of seabed resources. The United States position, which is representative of other developed countries, is that the proposed authority must balance the interests of the world community with reasonable safeguards for providing a stable investment environment for prospective developers. The developing nations, however, have proposed that the authority have very broad regulatory powers, including discretionary imposition of price and production controls. The author discusses the alternative proposals and expresses hope for a satisfactory compromise in the Third Substantive Session of the Conference scheduled to commence in New York in March, 1976. (Sloan-Florida)
W76-07814

ENVIRONMENTAL ASPECTS OF DEEP SEA MINING,
Center for Law and Social Policy, Washington, D.C.
R. A. Frank.
Virginia Journal of International Law, Vol. 15, No. 4, p 815-26 (1975). 12 p.

Descriptors: *Exploitation, *Metals, *Marine biology, *Mining, *Continental shelf, Sea water, Copper, Cobalt, Nickel, Water pollution, Water pollution sources, Environment, Ecology, Deep water habitat, Mining wastes, United Nations, United States, Sediments, Resources, Magnanese, Law of the sea, Foreign countries.
Identifiers: *Mineral nodules, *Deep seabed mining, *Ocean mining, *Ocean floor mining, United Nations Law of the Sea Conference(UNCLOS), Department of Interior.

The United States now imports approximately 95% of its manganese, 72% of its nickel, 15% of its copper, and 100% of its cobalt. In the last decade, several American and foreign companies have begun to develop systems for retrieving and processing mineral nodules found on the ocean floor. Within three years or so, technology will exist for commercial exploitation of these nodules, either by scraping the seabed with buckets, or by using a vacuum cleaner type suction system. While most of the nations of the world would gain economically from the resulting reduction in material costs, the resulting environmental effects of such exploitation are unknown. The Department of Interior has strongly recommended further study before attempting to assess the implications of deep seabed mining. Possible adverse effects of ocean floor mineral exploitation could include disturbance of unknown fauna and alteration of photosynthetic processes. The author discusses these and other possibilities, and outlines the potential environmental consequences of proposed domestic legislation and of the international regime being considered by the United Nations Law of the Sea Conference. (Sloan-Florida)
W76-07815

THE INTERPLAY OF LAW AND TECHNOLOGY IN DEEP SEABED MINING ISSUES,
Alfred P. Sloan School of Management, Cambridge, Mass.
J. D. Nyhart.
Virginia Journal of International Law, Vol. 15, No. 4, p. 827-68 (1975). 32 p.

Descriptors: *Exploitation, *Treaties, *Mineral industry, *International law, *Law of the sea, Manganese, United Nations, Mining, United States, International waters, Oceans, Mineralogy, Mining engineering, Nickel, Continental shelf, Oil industry, Technology, Regulation, Foreign waters, Copper, Governments, Foreign countries.
Identifiers: Manganese nodules, *Deep seabed mining, Marine environment, Mining systems.

New technology inevitably creates new legal responses. As a result of recent technological developments in the area of deep seabed mineral exploitation, the United Nations Conference on the Law of the Sea is attempting to construct a multi-national treaty which will govern use of international waters. Recent international negotiations have produced no apparent reconciliation between the industrialized nations, which support a system of licensing and regulation, and the developing countries, which support a system of full control of mining operations by an International Seabed Authority. Strong pressures are being brought to bear on the United States Government by American mining interests and their foreign consortia partners to pass legislation unilaterally extending regulatory control over United States nationals engaged in deep seabed mining. As an interim measure, such law might contribute to the experience of regulating new technology which would be necessary for the creation of an international regime. The author discusses various proposals and their possible consequences in relation to economic, environmental, and technological interests. (Sloan-Florida)
W76-07816

DISPARATE FISHERIES: PROBLEMS FOR THE LAW OF THE SEA CONFERENCE AND BEYOND,
Resources for the Future, Inc., Washington, D.C.
F. T. Christy, Jr.
Reprint No. 115, Summer, 1974.

Descriptors: *Marine fisheries, *Commercial fishing, *Law of the sea, *Foreign countries, Fish, Aquatic animals, Fish populations, Marine fish, Regulation, Legal aspects, International law, International waters, Surface waters, Fish conservation, Fish management, Fish harvest, Indian Ocean, United States.
Identifiers: *Coastal zone management, Coastal waters, West Africa, Northern Pacific Ocean.

There is little uniformity in the major fisheries throughout the world. This is shown by studies undertaken by the Program of International Studies of Fisheries Arrangements. These studies, conducted in anticipation of problems facing the UN Law of the Sea Conference, Conference, covered a variety of fishery regions. The North Pacific region involves a small number of states interested in fisheries, relatively few species of fish and regulations placed on limited stocks. Problms include: (1) higher world prices; (2) entry of new states; and (3) narrow agreements providing inadequate coverage of state's needs. About forty states are involved in the West Africa region where a large number of different species of fish resulted in rapid growth, in turn threatening depletion of stocks. Strict fisheries management and controls to prevent further waste are needed. Indian Ocean fisheries are underdeveloped with a significant potential for increased catch. The tuna fisheries require more stringent controls because of pressures exerted on the stocks. The uniform control necessary is impeded by the tuna's mobility and wide distribution. The Department of Fisheries of the Food and Agriculture Organization of the UN must take a more active role in providing the needed information, research and regulation. (Griffith-Florida)
W76-07817

THE HAWAIIAN ARCHIPELAGO DEFINING THE BOUNDARIES OF THE STATE,
Hawaii Univ., Honolulu. School of Law.
R. G. Schmitt, L. K. C. Luke, E. Yee, R. E. Strand, and C. Kerns.
University of Hawaii Sea Grant College Program, Working Paper No. 16, (October 1975). 103 p, 1 tab.

Descriptors: *Hawaii, *Boundaries(Property), *Islands, *International waters, *Federal-state water rights conflicts, Jurisdiction, Federal jurisdiction, State jurisdiction, Pacific Ocean, Oceans, Law of the sea, Natural resources, Governmental interrelations, Administrative agencies, Economic impact, Political aspects, Legal aspects, Coral, Manganese, Fishing.
Identifiers: *Archipelagos, Ocean thermal energy.

The chain of Hawaiian Islands is an integrated geophysical and biophysical configuration with most of its biological and mineral resources located in international waters. Uncontrolled exploitation of the resources in international waters poses environmental and economic threats to that portion of the resources within state jurisdiction. The authors examine the proposed claim of archipelagic status for Hawaii to determine benefits and problem areas. The discussion of methods for expanding the jurisdictional boundaries includes: (1) ocean claim theories; (2) treaties and international organizations; (3) unilateral state claims to extended jurisdiction; (4) United States oceanic claims; and (5) Hawaiian ocean claims. Island nations currently making archipelagic claims base them on the historic boundaries, the economic dependence on ocean resources, the need for state security, and the need to promote unity by placing connecting seas under state jurisdiction. The authors also analyse the effects of boundary expansion on the agencies of state government, the possible conflicts between state and federal government in areas where the federal government currently maintains controls, and the ocean resources of Hawaii which include fish, precious coral, deposits of manganese nodules and potential alternative energy sources. (Capehart-Florida)
W76-07818

THE WATER SUPPLY OF ROME,
College of Physicians of Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W76-07819

NON-POINT POLLUTION IN THE POTOMAC RIVER BASIN,
Interstate Commission on the Potomac River, Bethesda, Md.
For primary bibliographic entry see Field 5B.
W76-07820

CLEAN WATER FOR MID-AMERICA.
Federal Water Pollution Control Administration, Chicago, Ill. Great Lakes Region.
For primary bibliographic entry see Field 5G.
W76-07821

THE ROLE OF NORTH CAROLINA IN REGULATING OFFSHORE PETROLEUM DEVELOPMENT,
North Carolina Univ. at Chapel Hill. School of Law.
J. E. Kilpatrick.
Available from the National Technical Information Service, Springfield, Va 22161, as COM-75-10854, $4.00 in paper copy, $2.25 in microfiche. Sea Grant Publication, UNC-SG-75-09, April 1975, 29p.

Descriptors: *North Carolina, *Oil, *Water pollution, *Continental shelf, *Planning, Beds, Legislation, Natural resources, Oil pollution, International waters, Oil spills, Boundaries(Property), Jurisdiction, State governments, Federal government, Governmental interrelations, Political aspects, Oil industry, Navigable waters, Permits, Administrative agencies, Regulation, Dredging, Coasts, Zoning.
Identifiers: *Coastal zone management, Coastal waters, Absolute liability, Administrative regulations, Fill permits.

This pamphlet analyzes the existing legal framework to determine whether the state interests affected by offshore petroleum development are adequately protected. Effective planning and regulation of activities related to the state's submerged lands and outer continental shelf resources requires precise knowledge of the areas subject to state ownership and control. The northern and southern lateral seaward boundaries of North Carolina are unsettled at present. The relationship between state, federal and international jurisdiction over offshore submerged land resources is also uncertain. To insure that the State is aware of the stakes involved in settling these uncertainties, an extensive geologic inventory of the mineral resources within the inland and offshore submerged lands should be made. As to lands within state jurisdiction, the Department of National and Economic Resources should promulgate regulations for oil production from submerged lands. Other regulatory control could be obtained through the permit requirements of the state dredge and fill law and the federal Rivers and Harbors Act. These controls are aimed at pollution control, rather than pollution compensation, since both the state and federal government currently impose liability for oil spill damage. In addition to the above regulatory controls, Zone Management Act would allow regulation of drilling by declaring the submerged lands 'areas of environmental concern'. The author concludes that much more state and local planning, regulation and legislation are essential to sound development of petroleum deposits in North Carolina. (Capehart-Florida)
W76-07822

LEGAL CONSIDERATIONS FOR THE CONSTRUCTION AND OPERATION OF A DEEPWATER OIL TERMINAL IN THE DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
Center for Study of Marine Policy, Report CMS-7-75, Sept 1975, 27p.

Descriptors: *Delaware, *Oil, *Bays, *Permits, *Structures, Delaware River, Delaware River Basin Commission, Legal aspects, Pipelines, Storage tanks, State governments, Federal government, Coasts, Beds, Streams, Federal Water Pollution Control Act, Water quality, Water pollution, Legislation, Governmental interrelations, Regulation, Administrative agencies, Interstate compacts, Interstate commissions, Navigable waters.
Identifiers: *Delaware Coastal Zone Act, *Deepwater oil terminal, Administrative regulations, Coastal zone management, Coastal waters, Environmental impact statement, Corps of Engineers.

The right to sell, lease or permit submerged lands in Delaware Bay to be used for a deepwater oil terminal is limited by state statutes, interstate compacts and federal interests. The Delaware Coastal Zone Act presently prohibits such a terminal. County zoning regulations may entail county approval of the onshore storage tanks and pipelines needed to service a terminal facility. Permits from both the Delaware Department of Natural Resources and the Delaware River Basin Commission are required for each pipeline crossing of any stream flowing into the Delaware River and Bay. The Commission also has authority over any construction in the bay affecting water quality. Although the Delaware River and Bay Authority has claimed sole jurisdiction over any terminal construction in the bay, the authors conclude that such a position is untenable. The federal agencies concerned include the Corps of Engineers, the U.S. Coast Guard, the Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the Department of Commerce. An environmental impact statement would be required. The authors propose that any legislation permitting a terminal should provide for oil spill liability. (Capehart-Florida)
W76-07823

PUBLIC RIGHTS IN GEORGIA'S TIDELANDS,
Georgia Univ., Athens. Inst. of Government.
J. O. Smith, and J. L. Sammons.
Georgia Law Review, Vol. 9, p 79-114 (1974). 36p.

Descriptors: *Georgia, *Wetlands, *Tidal waters, *Coastal marshes, *Riparian rights, *Public rights, Shellfish, Oysters, Clams, State jurisdiction, Riparian waters, Estuaries, Estuarine fisheries, Tidal streams, Fishing, Public access, Navigable waters, Constitutional law, Non-navigable waters.
Identifiers: Foreshore, Tidelands, Public trust, Intertidal areas.

Since tidelands have a unique public value which is inconsistent with private ownership and control, the government has an obligation to regulate their use. This principle, the public trust doctrine, has evolved through the centuries. In discussing the status of public rights in the foreshore under present Georgia law, the authors trace the development of the doctrine under antecedent legal systems such as Roman civil codes, English common law and parlimentary statutes, and early American federal law. Interest in private shellfisheries and public fishing rights occupied a predominant position in the development of Georgia policy and culminated in the Georgia Tidelands Act of 1902, which recognized certain public rights in the foreshore. The Georgia Attorney General, however, has recently questioned the validity of the Act under the Georgia Constitution and recent case law addressing this problem has resulted in uncertainty as to public rights in non-navigable tidal streams. The authors urge that proper construction of existing law should continue protection of public trust doctrine is a valid basis for any regulatory scheme. (Sloan-Florida)
W76-07824

SCIENTIFIC RESEARCH ARTICLES IN THE LAW OF THE SEA INFORMAL SINGLE NEGOTIATING TEXT,
Rhode Island Univ., Kingston. Law of the Sea Inst.
W. T. Burke.
Occassional Paper 25, (June 1975). 16p.

Descriptors: *Law of the Sea, *Governmental interrelations, *Jurisdiction, *Resources development, *United Nations, Research and development, International waters, International law, Oceans, Continental shelf, Resource allocation, Water law, Economics, Economic impact, Foreign research, Exploitation, Exploration, Political aspects, Mining, Straits, Foreign countries.
Identifiers: *Coastal waters, Territorial seas(Jurisdiction), Coastal zone management, Economic zone, Coastal states, Seabed research, Ocean floor, High seas, Archipelagic waters.

This booklet suggests modifications to and explores the significance of the Informal Single Negotiating Text produced at the 1975 Geneva session of the Third Law of the Sea Conference. The Text is intended to serve as a basis for negotiation, with all participants free to propose amendments and stand on previous positions. Some of the more important Text provisions concerning the conduct of scientific ocean research are briefly examined. It is felt that all of the articles produced by the Committee Chairmen are unsatisfactory in terms of maintaining even a modest degree of freedom for research. In varying degree, each article permits restrictions on research by a coastal state or by the proposed International Authority which would be established to regulate seabed research beyond the limits of national jurisdiction. The issue is whether the consent of a coastal state ought to be required as a condition precedent to research in an economic zone or on the shelf. Certainly some mechanism should be established to assure that the research state or enterprise does in fact observe reasonable obligations to a coastal state, such as notification of projects, opportunity to participate, and access to data and specimens. (Reinders-Florida)
W76-07825

GEOGRAPHY AND THE LOS DEBATE: GEOGRAPHICAL FACTORS AND THE PATTERNS OF ALIGNMENT,
Rhode Island Univ., Kingston. Law of the Sea Inst.
L. M. Alexander.
In: Perspectives on Ocean Policy, p. 317-330, U. S. Gvt. Printing Office, Washington, D. C. 1974.

Descriptors: *Law of the sea, *International law, *Water policy, Water resources, *Foreign countries, Geographical regions, Negotiations, Islands, Jurisdiction, Commercial fishing, Fish management, Coasts, International commissions, Water resources development.
Identifiers: Economic zone, Land-locked countries, Geographically disadvantaged countries, Territorial seas.

Economic zone expansion has opened up several areas of potential international conflict. One involves the inequities of access to the ocean which could result to land-locked countries. For instance, it is yet undecided whether land-locked countries will be allowed access through coastal states or to share inzonal resources, such as fish and minerals. These questions are of utmost importance to states having potential access to bountiful fishing grounds. To other land-locked countries these questions are less significant since the economic zone waters of their coastal neighbors have little resource potential. These states are interested in some type of international agreement which would provide meaningful compensation for states found to be 'geographically disadvantaged'. Prospects for such a concept seem unlikely, however, since disagreement abounds as to what factors should be considered in defining a state as geographically disadvantaged. Other potential problem areas include: the jurisdictional powers of foreign dominated islands lying within the territorial seas of other countries; the rights of distant-water fishing countries having large capital investments in fishing fleets operating in foreign water; and regional alignments of nations hoping to protect their own special interests. (See also W76-07330) (Hoffman-Florida)
W76-07826

MAJOR ISSUES OF THE LAW OF THE SEA,
New Hampshire Univ., Durham.
1976, 229 p, 11 fig, 2 map, 13 tab, 1 chart, 6 ref. D. L. Larson, editor.

Descriptors: *Continental shelf, *Law of the sea, *International commissions, *International waters, *Treaties, Foreign trade, Foreign waters, Baseline studies, Jurisdiction, Economic life, Economic justification, Marine fisheries, Marine geology, Mining, Navigation, Bays, Straits, Pollution abatement, Technology, Beds under water.
Identifiers: *Coastal waters, Contiguous zone, Navigation obstructions, Territorial seas(Jurisdiction).

The purpose of this book is to provide a concise summary and quick reference source for major sea law issues. Sea law is largely international law and the book uses the 'Informal Single Negotiating Text and Text on Settlement of Disputes of the Third United Nations Conference of the Law of the Sea' to focus current issues. Discussion is centered around thirteen major areas: baselines, territorial seas, contiguous zones, economic zones, the continental shelf, the deep sea bed, islands and archipelagoes, the high seas, fisheries, navigation, marine pollution, marine research, and technology transfer, and the settlement of disputes. Each chapter presents historical positions on the issue, the Single Negotiating Text position, opposing rational viewpoints and related issues not discussed in the Single Negotiating Text. Charts and tables illustrate each chapter. The introduction presents the history of the United Nations attempts to resolve the issues discussed in general. More specific international agreements and discussions appear in each chapter. (See W76-07828 through W76-07842) (Comer-Florida)

W76-07827

INTRODUCTION,
New Hampshire Univ., Durham. Dept. of Political Science.
D. L. Larson.
In: Major Issues of the Law of the Sea, p. 1-14, Univ. of New Hampshire, Durham (1976).

Descriptors: *Continental shelf, *Law of the Sea, *International commissions, *International waters, *Treaties, Foreign waters, Foreign trade, Baseline studies, Jurisdiction, Economic life, Economic justification, Marine fisheries, Marine geology, Mining, Navigation, Bays, Straits, Pollution abatement, Technology, Beds under water.
Identifiers: *Coastal waters, Contiguous zone, Navigation obstructions, Territorial seas(Jurisdiction).

Primary emphasis is placed on the importance and effect of the adoption of the informal Single Negotiating Text and Text on Settlement of Disputes by the Third United Nations Conference on the Law of the Seas. By mid-nineteenth century the open nature of the high seas was generally resolved. But from that time until today other major issues involving territorial waters, economic interests, marine pollution, exploration and control of sea beds have remained in dispute. Many of these issues were first generally identified during a League of Nations Conference in 1930. The issues are complex, however, and three United Nations Conferences have succeeded only in focusing the disputes so that resolution can be attempted. The Single Negotiating Text is the focusing document. The Text is informal and binds no nation but it presents concise statements of majority positions. A consensual resolution of at least some of the issues is expected this year. (See also W76-07827) (Comer-Florida)
W76-07828

BASELINES,
Whittemore School of Business and Economics, Durham, N. H.
J. A. Walz.
In: Major Issues of the Law of the Sea, Chapter I, p. 15-27, Univ. of New Hampshire, Durham (1976).

Descriptors: *Baseline studies, *Coasts, *International commissions, *International law, Low water mark, Jurisdiction, Water law, Treaties, Coastal structures, Navigation, International Bound, Water Comm., Bays, Continental shelf.
Identifiers: *Territorial seas(Jurisdiction), *Coastal waters, Coastal zone management.

Baseline determination is the starting point for all claims to areas of the oceans. Two historical methods of baseline determination exist; the headland to headland and the coastal parallel. A 1930 League of Nations Convention adopted the coastal parallel which is generally the method used today. Norway, however, still uses headland determination. The Informal Single Negotiating Text proposes coastal parallels for normal baselines, determined by the coastal low water line. Straight baselines are acceptable for deeply indented or island fringed coasts. Mixtures may be employed. Reefed islands have seaward edge of the reef lines. Bays, except historic bays, have baselines drawn as straight lines not longer than 24 nautical miles across the entrance. For baseline determination, permanent harborworks are part of the coast. Offshore installations are not. The text refers to historic waters and historic bays without providing adequate definition. A problem may result. Treatment of adjacent and opposite coastal state rights is inadequate. Baseline determination is not a highly disputed negotiation issue. (See also W76-07827) (Comer-Florida)
W76-07829

THE TERRITORIAL SEA,
Whittemore School of Business and Economics, Durham, N. H.
J. A. Walz.
In: Major Issues of the Law of the Sea, Chapter II, p. 28-37, Univ. of New Hampshire, Durham (1976).

Descriptors: *Marine fisheries, *International law, *International commissions, *Treaties, Political constraints, Boundaries(Property), Coasts, Navigation, Economic justification, Jurisdiction, Bays, Straits, Foreign trade, Foreign waters, Foreign countries.
Identifiers: *Territorial seas(Jurisdiction), *Coastal waters, Contiguous zone, Navigation obstructions.

The territorial sea concept of coastal state jurisdiction over law of the sea issues within the area is well established. Current dissension exists, however, concerning the breadth of the territory. A majority of nations claim 12 mile limits or less but ten countries claim 200 or more nautical miles. All of the countries are in agreement, however, that coastal state sovereignty includes air, bed and subsoil sovereignty. To achieve agreement on territorial sea issues, the United Nations Law of the Sea Conference drafted Informal Single Negotiations Text. The text has proposed a twelve nautical mile maximum limit, with equidistant median line limits being set for opposite coastal states less than 24 miles apart. The larger territorial sea claims of developing nations present a roadblock to the acceptance of this text. Consequently, a package deal is proposed including economic zones and special fishery rights along with 12 nautical mile limits. The package is intended to improve agreement prospects. (See also W76-07827) (Comer-Florida)
W76-07830

THE CONTIGUOUS ZONE,
Whittemore School of Business and Economics, Durham, N.H.
J. A. Walz.
In: Major Issues of the Law of the Sea, Chapter III, p. 38-44, Univ. of New Hampshire, Durham (1976).

Descriptors: *International law, *International commissions, *Treaties, *Marine fisheries, *Foreign waters, Foreign trade, Jurisdiction, Economic justification, Coasts, Navigation, Political constraints, Continental shelf, Foreign countries, United Nations.
Identifiers: Contiguous zone, Coastal waters, Territorial seas(Jurisdiction), Navigation obstructions.

The contiguous zone is an area outside the territorial sea over which a nation may exercise rights less than sovereignty. The concept predates territorial seas but lost recognition with the establishment of sovereign sea areas. The contiguous zone has regained popularity in lieu of larger territorial seas. Unlike territorial seas, contiguous zones are high seas areas with limited shipping interference. Coastal state seizure of vessels is allowed only under the hot pursuit doctrine. The Informal Single Negotiating Text proposes a contiguous zone extending not more than 24 nautical miles from the baseline. The coastal state may use the zone to prevent or punish violations of customs, fiscal, immigration and sanitation laws within the territorial sea. Civil and criminal jurisdiction is limited to criminal activity against the coastal state or threatening territorial seas, narcotics suppression or requests for assistance. The contiguous zone may lose importance if the economic zone of the Text is adopted. In any event, the principles associated with the contiguous zone may be applied to the economic zone. (See also W76-07827) (Comer-Florida)
W76-07831

THE ECONOMIC ZONE,
Whittemore School of Business and Economics, Durham, N. H.
R. W. Pabst.
In: Major Issues of the Law of the Sea, Chapter IV, p. 45-51, Univ. of New Hampshire, Durham (1976).

Descriptors: *International law, *International commissions, *Treaties, *Marine fisheries, Mining, Coasts, Navigation, Boundaries(Property), Economic justification, Eco-systems, Ecology, Fish conservation, International waters, Foreign trade, Foreign waters, Continental shelf.
Identifiers: Coastal waters, Contiguous zone, Territorial seas(Jurisdiction), Navigation obstructions.

The economic zone is an area beyond the territorial sea with coastal state sovereignty over natural resources. The concept is the result of pressure from developing countries for greater participation in sea resource development. The 1958 Convention on the Continental Shelf recognized coastal sovereignty over an indefinite extent of shelf seabed and subsoil. The Informal Single Negotiating Text proposes expansion of sovereignty to include fisheries and a 200 nautical mile limit. Under the Text coastal states have sovereignty rights over all natural resources of the sea bed, the subsoil and the superadjacent waters. This sovereignty does not extend to the area itself, however, and the extent of sovereignty is a disputed issue. If sovereignty over the area is adopted the result would be an extended territorial sea where navigation rights could be seriously impaired. Rights of opposite coastal states is also an unresolved issue. The text contemplates future treaty arrangements to solve the above issues. (See also W76-07827) (Comer-Florida)
W76-07832

CHAPTER V: THE CONTINENTAL SHELF,
New Hampshire Univ., Durham. Law of the Sea Intern Program.
D. Campbell III.
In: Major Issues of the Law of the Sea, Chapter V p. 52-66, Univ. of New Hampshire, Durham (1976).

Descriptors: *Continental shelf, *International law, *International commissions, *Treaties, *Mining, Coastal structures, Coasts, Foreign waters, International waters, Marine geology, Beds under water, Boundaries(Property), Baseline studies, Navigation, Foreign trade, Technology, Pollution abatement.
Identifiers: *Coastal waters, Contiguous zone, Territorial seas(Jurisdiction), Navigation obstruction, Coastal zone management.

Claims to continental shelf sovereignty are relatively recent dating from 1944. By 1950 more than 30 nations had made claims. Increasing technology and energy needs have caused growing interest in shelf resources. The 1958 Convention recognized claims to areas of ocean depth of 200 meters or to a point at which exploitation is not admitted. The Informal Single Negotiating Text links shelf sovereignty to the economic zone and gives coastal states sovereignty rights in subsoil and seabed beneath the 200 nautical mile zone. As with the economic zone the extent of continental shelf sovereignty is important. Sovereignty over resources but not over the area allows coastal state resource protection without impeding navigation rights of other nations. The Text also addresses the unresolved issue concerning the rights of opposite coastal states. Exploitation is allowed beyond the continental shelf limit but details of inspection of installations and payment for rights are left for future negotiation. (See also W76-07827) (Comer-Florida)
W76-07833

THE DEEP SEA-BED,
Whittemore School of Business and Economics, Durham, N.H.
J. A. Walz.
In: Major Issues of the Law of the Sea, Chapter VI p. 67-83, Univ. of New Hampshire, Durham (1976)

Descriptors: *International waters, *International law, *Mining, *International commissions, Technology, Marine geology, Investment, Jurisdiction, Foreign waters, Ecology, Pollution abatement, Minerology, Oil, Copper, Zinc, United Nations.
Identifiers: *Public trust doctrine, Navigation obstructions, Coastal zone management.

Treatment of the deep sea bed is the most controversial issue facing the Third Conference. The 1958 Convention ignored the issue because of lack of technology and interest. The interest has grown rapidly, however, and eight entities are currently waiting to mine seabed resources. Although the claim is not generally recognized, one company has already claimed certain Pacific Ocean floor areas. The United States Senate is considering a bill allowing mining claims despite lack of international agreement. The Third Conference received two negotiation proposals. The 'Pinto Text' limits international authority over mining to resource activity. The United States favors the 'Pinto Text'. The 'Engo Text' is the Informal Single Negotiating Text proposal. The 'Engo Text' provides for international control over all seabed activities. Major areas of controversy include the extent of international authority, the right of national mining by states, and the composition and organization of the international seabed authority. Near agreement is not expected and threats of unilateral action cause concern. (See also W76-07827) (Comer-Florida)
W76-07834

FISHERIES,
Whittemore School of Business and Economics, Durham, N.H.
R. W. Pabst.
In: Major Issues of the Law of the Sea, Chapter VII p. 84-106, Univ. of New Hampshire, Durham (1976).

Descriptors: *Marine fisheries, *International law, *Anadromous fish, *Catadromous fish, *International commissions, Conservation, Marine fish, Navigation, Foreign waters, Foreign trade, Migration patterns, Fish, Natural resources, Treaties, Economic impact, Economic justification, Ecosystems, United Nations.
Identifiers: *Coastal waters, Territorial seas(Jurisdiction), Mercury pollution, Coastal zone management.

The long accepted concept of free access to ocean fisheries is based upon a theory of inexhaustible resources. Estimates today, however consider that the maximum potential yield from traditional fisheries will be reached by the year 2000. Consequently, conservation of resources is a major concern. Fishing rights treaties data from the eighteenth century but not until after World War II was any concern expressed for the depletion of coastal area fish. In 1958, the Geneva Conference recognized conservation needs and provided arbitration for disputes; but it granted coastal states only preferential rights. The modern trend, despite the objections of fishing interests, is toward exclusive control by the coastal states. This trend is illustrated by the Informal Single Negotiating Text which adopts the sovereignty over resources approach. Under this approach, coastal states can control and are responsible for conservation within their jurisdictional area, with special provisions being made for migratory anadromous and catadromous species. Although differing positions continue on the enforcement by flagship states or coastal states, the text grants coastal jurisdiction. Despite this text, controversy and discussion will continue to exist concerning contiguous zone jurisdiction and the responsibility and answerability of coastal states for fish conservation. (See also W76-07827) (Comer-Florida)
W76-07835

MARINE POLLUTION,
New Hampshire Univ., Durham. Law of the Sea Intern Program.
D. Campbell, III.
In: Major Issues of the Law of the Sea, Chapter VIII, p. 107-124, University of New Hampshire, Durham (1976).

Descriptors: *Pollution abatement, *International law, *International commissions, *Treaties, *Oil, Spills, Oil pollution, Industrial wastes, Navigation, Marine fisheries, Ecology, Ecosystems, Mining, Jurisdiction, United Nations, , Foreign countries, Ships.
Identifiers: *Public trust doctrine, *Mercury pollution, Coastal waters, Coastal zone management.

Because the 1954 Convention considered only vessel-source oil pollution, and because enforcement was exclusively the flag state's, this first attempt to control international marine pollution was only limitedly effective. The 1973 Convention (IMCO) should be more effective since it is applicable to numerous harmful substances, not just oil. Several problems of international pollution control remain undecided, however. For example, exclusive flag state jurisdiction continues in IMCO, thus reducing effective enforcement. Furthermore, land based pollution, representing 50 to 90% of marine pollution, is still unregulated. The 1975 Informal Single Negotiating Text is attempting to address some of these problems and is proposing: to regulate land and vessel source pollution; to provide enforcement by flag, coastal and port states; to allow coastal states to establish standards within zones of control; to establish a five member committee to settle disputes. All of the proposals are controversial, with ambiguity and conflicting interests posing serious problems. The major conflicts are between the developing and developed countries, with the developing nations being less interested in pollution than in prosperity. In addition, the United States and some other developed maritime nations support exclusive flag state control, a concept which is generally opposed by developing nations. Another controversy, with special opposition by the United States, is the open ended provision that coastal states may apply to the committee for protection of 'special areas'. Because of these conflicts a strong agreement is doubtful. (See also W76-07827) (Comer-Florida)
W76-07836

NAVIGATION,
New Hampshire Univ., Durham. Law of the Sea Intern Program.
D. Campbell, III.
In: Major Issues of the Law of the Sea, Chapter IX, p. 125-139, Univ. of New Hampshire, Durham (1976).

Descriptors: *Navigation, *International law, *International commissions, *Treaties, *Foreign waters, Foreign trade, Straits, Bays, Jurisdiction, Law of the sea, Continental shelf, Marine fisheries, Pollution abatement, United Nations, Oceans.
Identifiers: *Coastal waters, Territorial seas(Jurisdiction), Navigation obstructions.

Navigation is a traditional freedom of the seas and includes the principles of neutrality, flag state control of vessels, rights of innocent passage through territorial seas, and absolute freedom of transit through straits. The 1958 Convention codified many navigational concepts but mixed innocent passage rights with freedom of transit. Whether distinction of the principles should be made is one of the issues before the 1975 Conference. Archipelagic rights, economic zone control and pollution control may all impede navigation and a balance must be reached. The Informal Single Negotiating Text sets standards for determining if passage in territorial seas is innocent and allows coastal state prevention if it is not. Coastal states may also adopt programs to insure navigational efficiency and safety, and may control fishing, conserve resources and prevent pollution in territorial waters. The text also contains the following provisions: unimpeded transit shall govern straits subject to pollution, safety and fishing laws; freedom of navigation shall exist in economic zones; and landlocked states shall have free access to the sea. Despite these provisions, some coastal states prefer innocent passage through straits while others prefer coastal sovereignty over economic zones. Consequently, numerous compromises will have to be made before a strong agreement can be reached. (See also W76-07827) (Comer-Florida)
W76-07837

ISLANDS AND ARCHIPELAGOES,
Whittemore School of Business and Economics, Durham, N. H.
R. W. Pabst.
In: Major Issues of the Law of the Sea, Chapter X, p. 140-158, Univ. of New Hampshire, Durham (1976).

Descriptors: *Coasts, *Baseline studies, *International commissions, *Law of the seas, *Navigation, International law, Jurisdiction, Continental shelf, Marine fisheries, Straits, Foreign trade, Foreign waters, Treaties, United Nations.
Identifiers: *Coastal waters, Territorial seas(Jurisdiction), *Navigation obstructions.

The major international concern with archipelagoes arises because use of straight baselines may impede navigation. Archipelagoes were a concern of the 1930 Hague Conference but no agreements were reached. From 1930 to present the major question of archipelagoes has been baseline and internal waters determination. The Informal Single Negotiating Text defines archipelagoes as a group of island with all natural features forming a geographic, economic and political entity. An archipelagic state (AS) is one or more archipelagoes and other islands if necessary. An AS may draw straight baselines joining its outermost points if the ratio of water area to land is between 1 to 1 and 9 to 1. Once this baseline is determined, the AS sovereignty extends to all waters enclosed. Since 'archipelagic waters' are not necessarily internal waters, AS's may not suspend sealane passage in contravention of innocent passage. rights. An AS may establish sealanes but may not suspend sealane passage. Safety, pollution control and fishing laws are allowable. The Text proposals will not settle disputes such as the current Greek-Turkish dispute over Aegean seabeds. It will also not settle other areas of difficulty. Indonesia, for instance, claims the Straits of Malacca as territorial - open to commercial navigation but not to warships. Major maritime powers oppose this position. Despite these unsolved problems, the text should have beneficial effects. (See also W76-07827) (Comer-Florida)
W76-07838

MARINE SCIENTIFIC RESEARCH AND THE TRANSFER OF TECHNOLOGY,
Whittemore School of Business and Economics, Durham, N. H.
J. A. Walz.
In: Major Issues of the Law of the Sea, Chapter XI, p. 159-174, Univ. of New Hampshire, Durham, (1976).

Descriptors: *Coasts, Technology, *International law, *International commissions, *Law of the seas, Mining, Marine geology, Marine biology, Scientific personnel, Jurisdiction, Communication, Foreign countries, United Nations, Research and development.

Identifiers: *Public trust doctrine, Licenses, Navigation obstructions, Congressional hearings, *Technology transfer.

Present international law recognizes coastal state control of continental shelf and territorial sea research and flag state control of high seas research. The major issue involving marine research before the 1975 Geneva Conference is whether coastal state consent is required for research in controlled zones. Coastal states have been reluctant to grant consent in the past for two main reasons: protection of resources and lack of technology transfer. The Informal Single Negotiating Text attempts a compromise. Coastal state consent will be required for research connected with living and non-living resources while consent will not be required for non-resource related research. Coastal states will also have the exclusive right to conduct research in territorial seas. In addition, economic zone and continental shelf research must respect the rights of coastal states. Furthermore, the coastal states will have a participation right and access to results. The Text recognizes that high seas research is a right of all states but it requires that the Sea Bed Authority be informed of the project and that the results be published. This technology transfer will be further promoted through training and documentation programs. Any disputes which arise under the Text will be settled by a special committee of experts. The compromise Text will probably be adopted since major problems are administrative rather than substantive. (See also W76-07827) (Comer-Florida)
W76-07839

SETTLEMENT OF DISPUTES,
Whittemore School of Business and Economics, Durham, N.H.
J. A. Walz, and D. Campbell, III.
In: Major Issues of the Law of the Sea, Chapter XII, p. 175-189, Univ. of New Hampshire, Durham (1976).

Descriptors: *Continental shelf, *International commissions, *International law, *Jurisdiction, *Law of the seas, International waters, Mining, Marine fisheries, Navigation, Coasts, Boundaries(Property), Marine geology, Pollution abatement, Ships.

A world wide treaty on law of the sea issues requires some form of dispute settlement procedures for three major reasons: the necessary avoidance of economic and political pressure; the need for uniformity of Convention interpretation and application; and the assurance to nations that their interests are equally protected. Historically, dispute settlement has taken two forms, terms dictated by a third party as in arbitration or judicial settlement, and terms agreed upon by the parties through mediation or conciliation. The Informal Single Negotiating Text adopts three procedures substantially identical to those incorporated into the 1930 Hague Conference: (1) arbitration, (2) conciliation and (3) fact finding and decisions of a tribunal. All contracting states must choose at least one method. The selection of members and procedures proposed attempt to encompass as many aspects of settlement as possible. An important omitted issue is the time within which rapid decision making must be effected in cases of vessel delay. Another area of dispute is dispute settlement in economic zone or continental shelf disagreements. (See also W76-07827) (Comer-Florida)
W76-07840

THE HIGH SEAS AND SELECTED SPECIAL ISSUES,
New Hampshire Univ., Durham. Law of the Sea Intern Program.
D. Campbell III.
In: Major Issues of the Law of the Sea, Chapter XIII, p 190-213, Univ. of New Hampshire, Durham (1976).

Descriptors: *International waters, *International commissions, *Continental shelf, *International law, *Navigation, Foreign waters foreign trade, Jurisdiction, Straits, Pollution abatement, Marine geology, Marine fisheries, Law of the sea, Coasts, United Nations.
Identifiers: *Public trust doctrine, Navigation obstructions.

The high sea areas continue to contract as concepts of economic zones, continental shelves and archipelagic waters develop. The rights and freedoms codified in the 1958 Convention still exist in the 1975 Single Informal Negotiating Text although the area covered is less. These include the following: freedom of navigation; freedom of overflight; freedom to lay submarine cables and pipelines; freedom to construct installations permitted by international law; freedom of fishing subject to other Text provisions; and freedom of scientific research subject to Text restrictions. Flag state vessel jurisdiction continues on high seas, but the right of hot pursuit is modified by economic zone considerations. The 'high seas' is defined in the Text as all parts of the sea not in the economic, territorial, internal waters or archipelagic zones. Other issues raised by the Text but not totally resolved are enclosed and semi-enclosed seas, national security aspects of sea law, conservation measures for resources, and the problems of land locked states. The land locked states controversy concerns the degree to which such states have a right to free access to the high seas and to a sharing of the sea resources of adjacent coastal states. Details of this and other issues must be worked out through bilateral and regional agreements. (See also W76-07827) (Comer-Florida)
W76-07841

CONCLUSION,
New Hampshire Univ., Durham. Law of the Sea Intern Program.
D. Campbell III, D. L. Larson, T. W. Pabst, and J. A. Walz.
In: Major Issues of the Law of the Sea, p 214-223, Univ. of New Hampshire, Durham (1976).

Descriptors: *Continental shelf, *Law of the sea, *International commissions, *International law, *Treaties, Jurisdiction, Baseline studies, Coasts, Marine fisheries, Navigation, Mining, Marine geology, Straits, Pollution abatement, Beds under water, United Nations, Water pollution control.
Identifiers: Coastal waters, Contiguous zone, Navigation obstructions, Territorial seas(Jurisdiction), Public trust doctrine.

The Third United Nations Conference on the Law of the Sea convened in response to pressures arising and reaching acute stages within the past few years. The Conference is the largest ever convened and the variety of interests represented has had repercussions far beyond mere codification of existing law. The complexity of issues faced by the Conference is mirrored in the pressures being exerted within the United States. Mining companies, for instance, are directly in conflict with fisheries while conservationists oppose both interests. The United States has formulated a policy to use every reasonable means to aid developing countries; however, the U. S. is concerned about the possibility of navigation rights interferences and stringent sea bed authority. The main thrust of U. S. policy is stability and order with corresponding national freedom. If the Third Conference cannot arrive at agreement, no disastrous results will follow; but the current status of sea law, which is uneven and ambiguous, will continue. With the problems facing the world today, ad hoc problem solving is inefficient. There is a probability of adoption of several proposed conventions even if all issues are not resolved. (See also W76-07827) (Comer-Florida)
W76-07842

PREPARATION OF WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07843

ORE MINING AND DRESSING POINT SOURCES CATEGORY, INTERIM FINAL RULES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07844

ORE MINING AND DRESSING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07845

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION CONCENTRATED ANIMAL FEEDING OPERATIONS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07846

COAL MINING POINT SOURCE CATEGORY: APPLICATION OF EFFLUENT LIMITATIONS GUIDELINES FOR EXISTING SOURCES TO PRETREATMENT STANDARDS FOR INCOMPATIBLE POLLUTANTS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07847

COAL MINING POINT SOURCE CATEGORY, INTERIM FINAL RULE MAKING.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07848

MINERAL MINING AND PROCESSING POINT SOURCE CATEGORY INTERIM FINAL RULEMAKING.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07849

GRAIN MILLS POINT SOURCE CATEGORY: PROPOSED PRETREATMENT STANDARDS FOR NEW SOURCES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07850

INK FORMULATING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07851

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07852

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07853

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07854

CANNED AND PRESERVED FRUITS AND VEGETABLES PROCESSING INDUSTRY POINT SOURCE CATEGORY, INTERIM FINAL RULE MAKING,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07855

IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY PROPOSED EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-07856

CANNED AND PRESERVED FRUITS AND VEGETABLES PROCESSING INDUSTRY POINT SOURCE CATEGORY PROPOSED EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-07857

FRAMEWORK AND RIVER BASIN STUDY PROGRAMS, LEVEL A AND LEVEL B STUDIES.
Corps of Engineers, Washington, D. C.
Federal Register, Vol. 40, No. 145, p. 31718-22, July 28, 1975. 5 p. 1 tab.

Descriptors: *U.S. Water Resources Council, *Federal Water Pollution Control Act, *Planning, *Water resources development, Water supply development, Water resources research, Regional analysis, Regional development, Future planning(Projected), Water management(Applied), Coordination, Federal government.
Identifiers: Administrative regulations.

This regulation provides general guidelines for Corps of Engineers' participation in multi-agency studies of Level A scope (Framework and Assessment) and Level B scope (Regional or River Basin) as defined by the Water Resources Council (WRC). There are three general levels of studies in the Federal water planning programs: Level A Assessments and Framework, Level B Regional or River Basin Studies, and Level C Implementation Studies. Level A, the broadest, is an analysis of water and related land problems in major regions of the United States. Level B studies are made at the regional level, and encompass problems of a complex, inter-disciplinary nature, involving judgmental planning with no new data collection and multi-agency planning under the guidance of the WRC. The Corps of Engineers' role in Level A and Level B studies will usually be that of a participant, but in some cases, the coordinating field entity may request the Corps of Engineers to take charge. Where there is no coordinating field entity the Corps of Engineers may be directly named as the study sponsor by the WRC. (Edenfield-Florida)
W76-07858

NAVIGATION OF RESTRICTED AREAS.
Corps of Engineers, Washington, D. C.
Federal Register, Vol. 40, No. 138, p. 30118-19, July 17, 1975. 2p.

Descriptors: *South Carolina, *Navigable waters, *Rivers and Harbors Act, *River regulation, *Navigation, Rivers, Legislation, Planning, Tributaries, Federal jurisdiction, Federal government, Boating regulations, Administrative agencies, Management, Operations, Water policy, Water rights, Control, Boundaries(Property).
Identifiers: Water rights(Non-riparians), Administrative regulations, Restricted areas.

Notice is given of tentative regulations proposed by the Secretary of the Army pursuant to Section 7 of the River and Harbor Act of 1917. The proposed regulations govern the use and navigation of restricted areas in the Cooper River and its tributaries at Charleston, South Carolina. It is proposed to amend the present regulations with respect only to the extension of boundaries of the restricted areas. Prior to adoption, consideration will be given to any comments, suggestions or objections thereto which are submitted. (Reinders-Florida)
W76-07859

OCEAN DUMPING.
Jt. Hearings -- Sub. Comm. on Fisheries and Wildlife Conservation and the Environment and Sub. Comm. on Oceanography -- Comm. on Merchant Marine and Fisheries, U.S.H.R., April 24, 25, 1975, p. 1-171.

Descriptors: *Waste disposal, *Waste dumps, *Water pollution control, *Oceans, *Water quality, Water pollution effects, Pollution abatement, Radioactive waste disposal, Municipal wastes, Biological warfare, Chemical warfare, Federal jurisdiction, Administrative agencies, Federal reservations, Legislation, Great Lakes Region, Permits.
Identifiers: Administrative regulations, Licenses, *Ocean dumping, Sanctuaries, Coastal waters, Marine Protection, Research, and Sanctuaries Act of 1972, Warfare wastes.

In April, 1975, hearings were conducted before two Senate subcommittees to consider legislation that would extend certain appropriation authorization under the Marine Protection, Research, and Sanctuaries Act of 1972. This Act is composed of three titles: Title I places an outright ban on the dumping of high-level radioactive wastes and all biological, chemical, and radiological warfare agents into the nation's waters. Also, it prohibits the dumping into these waters of all other waste material, except as authorized by permit issued by the Environmental Protection Agency (EPA) or the Secretary of the Army. Title II requires the Secretary of Commerce to carry out comprehensive and continuing programs of research on the effects of the dumping of waste material into the nation's oceans, brackish waters, and the Great Lakes. Title III authorizes the designation of certain areas in these waters as marine sanctuaries when deemed necessary for preservation or restoration of such areas for their conservation, recreational, ecological or aesthetic values. Included in the hearing report are materials provided by the Coast Guard, Corps of Engineers, EPA, National Wildlife Federation and the National Oceanic and Atmospheric Administration. (Reinders-Florida)
W76-07860

STATUS REPORT ON LAW OF THE SEA CONFERENCE.
Hearings---Sub Comm on Minerals, Materials and Fuels---Comm on Interior and Insular Affairs, U.S. Senate, October 29, 1975, p 1423-1592.

Descriptors: *United Nations, *Commercial fishing, *Manganese, *Mining, *Law of the Sea, Exploration, Fishing, Fish, Marine fisheries, Metals, Copper, Nickel, Cobalt, Navigation, Continental shel, Oil, Resources, Oceans, Treaties, International law, United States.
Identifiers: *Deep seabed mining, Territorial seas(Jurisdiction), Marine resources, Coastal waters, Coastal fisheries, Fishing zone.

Concern over depletion of fish stocks in the United States' off-shore waters caused the introduction of legislation in Congress which would allow the United States to order a reduction of effort by foreign fishermen. This in turn led to concern by the United States delegation to the United Nations that such unilateral action would impede negotiations at the United Nations Law of the Sea Conference, which hopefully will produce an international body of law regulating all use of the seas. U.S. representatives feel that the Conference may reach an agreement relative to off-shore fishing regulation in the foreseeable future. However, it appears that no agreement will be reached until there is some consensus on the problem of deep-seabed mining rights. Many of the smaller member nations, which constitute a majority of the votes, are demanding regulations such as price and production controls and disproportionate profit sharing by nations not participating in the effort of extracting the deep-sea minerals. The United States does not consider these proposals to be reasonable. This status report, the fourth in a series, includes position papers by concerned organizations and individuals. (Sloan-Florida)
W76-07861

DEVELOPMENT OF NEW REGULATIONS BY THE CORPS OF ENGINEERS, IMPLEMENTING SECTION 404 OF THE FEDERAL WATER POLLUTION CONTROL ACT CONCERNING PERMITS FOR DISPOSAL OF DREDGE OR FILL MATERIAL.
Hearings--Sub. Comm. on Water Resources---Comm. on Public Works and Transportation, USHR, July 15, 16, 22, 1975. p. 1-292.

Descriptors: *Federal jurisdiction, *Federal Water Pollution Control Act, *Dredging, *Water quality control, *Federal government, Water pollution control, Administrative agencies, Governmental interrelations, Environmental effects, Navigable waters, Tributaries, Tidal waters, Management, Decision making, Planning, Permits.
Identifiers: Administrative regulations, Coastal waters, FWPCA Amendments of 1972, Fill permits, Licenses.

Hearings were held to receive a status report on the development of proposed alternative regulations by the Corps of Engineers to implement section 404 of the Federal Water Pollution Control Act. This section assigns the regulation of the discharge of dredged materials in navigable waters to the Secretary of the Army acting through the Chief of Engineers and with guidance from the Administrator of the Environmental Protection Agency (EPA). The Corps' jurisdiction was thought to extend only to those water areas within the classical definition of navigable waters, namely, those waters subject to the ebb and flow of the tide or that may be susceptible of use for interstate or foreign commerce. On March 27, 1975, however, the District Court for the District of Columbia ruled that prior regulations did not recognize the full regulatory mandate of Section 404. Accordingly, two of the present alternatives propose a limited expansion of the term 'navigable waters' to include their primary tributaries and all coastal waters supporting salt water vegetation. The remaining two alternatives propose broad definitions of the term. Proposed decision making guidelines developed by the EPA were publised concurrently with these four proposed alternatives. (Reinders-Florida)
W76-07862

TWO -HUNDRED -MILE FISHING ZONE.
Hearing---Sub Comm on Oceans and International Environment---Comm on For Relations, US Senate, October 31, 1975, p 1-443.

Descriptors: *United States, *Continental shelf, *International law, *Law of the Sea, *Fish conservation, Fisheries, Anadromous fish, Fish management, Fishing, Commercial fishing, Conferences, Federal government, Federal jurisdiction, Foreign waters, Governments, Legal aspects, Legislation, Foreign countries, Foreign trade.
Identifiers: *Fishery conservation zone, Law of the Sea Conference.

Proposed Bill S. 961 seeks to restore and maintain the offshore fisheries of the United States by granting the United States exclusive fishery management jurisdiction extending two hundred nautical miles over fishery resources found on the Continental Shelf. The Bill is a temporary emergency measure, to be effective July 1, 1976, resulting from the failure of first and second sessions of the United Nations Law of the Sea Conference to reach agreement establishing an orderly regime for world fishing resources. It will cease effectiveness once the Law of the Sea treaty has been signed. The opposition argues other nations will unilaterally extend and make similar claims thereby frustrating negotiations for upcoming Conferences; and that violation of international law will occur, producting conflict with foreign nations, especially the Soviet Union and Japan. However, other nations have already exceeded the current three mile legal maximum. In light of the extreme need for protective legislation the Bill should be passed. In addition the United States leadership in extending the three mile limit will provide encouragement and trigger acceptance of the two hundred mile limit at the next Law of the Sea Conference. (Hadoulias-Florida)
W76-07863

TO AMEND THE LAND AND WATER CONSERVATION FUND ACT OF 1965 AND TO AMEND THE HISTORIC PRESERVATION ACT OF 1966.
Hearings---Sub Comm on Nat Parks and Recreation---Comm on Interior and Insular Affairs, US HR, July 28, 1975, p. 1-149.

Descriptors: *Recreational facilities, *Leases, *Recreation demand, *Economic feasability, *Oil industry, United States, Resources, Recreation, Conservation, Oil, Land use, Resources development, Resource allocation, Land resources, National parks, Social needs, Water demand, Land management, Legislation, Water resources development.
Identifiers: Land and Water Conservation Fund, Offshore oil and gas.

The Land and Water Conservation Fund draws most of its income from Federal receipts from Outer Continental Shelf Oil and gas leasing. The fund is then used to acquire Federal recreation lands and to make matching grants to state and local governments for the same purpose. State and local needs for such lands are increasing, and the proposed amendments would increase the amounts to be made available for matching funds while establishing a historic preservation fund drawing its income from the same leasing receipts. Gross receipts from Outer Continental Shelf leases were approximately two-and-a-half billion dollars in Fiscal Year 1975 and were expected to be approximately 8 billion in Fiscal Year 1976. Contained in the record are letters and testimony in opposition to the amendments in their present form, including statements of representatives of the Secretaries of Agriculture and Interior on behalf of the Administration moratorium on new federal spending programs. The record also contains favorable testimony from members of Congress, state agencies, and organizations such as the Sierra Club and the National Wildlife Federation. (Sloan-Florida)
W76-07864

GEOTHERMAL ENERGY DEVELOPMENT.
Hearings---Sub Comm on Energy Research and Water Resources Comm on Intern and Insular Affairs, US Senate, October 17, 1975, p 1-515.

Descriptors: *Idaho, *Geothermal studies, *Government finance, *Research and development, *Energy, Electricity, Economic impact, Engineering, Engineering structures, Federal government, Geographic regions, Government supports, Governmental interrelations, Research equipment, Research facilities, Research priorities, Leases.
Identifiers: *Raft River Geothermal Development Co-operative, Hot water systems, *Geothermal leasing, Geothermal Steam Act, Development and Demonstration Act of 1974, Alternative energy sources.

Hearings have been held before the Subcommittee on Energy Research and Water Resources to receive testimony on the progress of the Raft River Geothermal Development Co-operative in the state of Idaho. A promising hot water system has been discovered utilizing hot water of 300 degrees F. in a binary Magmamax-type powerplant. Geothermal heat would be applied to a secondary fluid, heated then expanded, inexpensively generating electricity. Energy Research and Development Administration (ERDA) funding for construction of a ten megawatt pilot plant would supply Raft River area's electrical needs while also providing the Nation with valuable research in geothermal energy potential. Funds have been supplied by state and local agencies and private lands have been leased by the Co-operative for geothermal development rights. ERDA's delay in funding results from deliberations concerning construction of a fifty megawatt commercial demonstrative plant for which the same Raft River site is a promising location. No guarantees that Raft River will be granted the fifty megawatt demonstration project in lieu of the proposed ten megawatt pilot plant have been made and Raft River needs funds now. Possible solutions include revision of the Geothermal License Act requiring leasing of geothermal land for preliminary explorations, and the granting of leasing rights to those first filing or first locating commercially valuable geothermal resources. (Hadoulias-Florida)
W76-07865

WATERSHED PROJECTS.
Hearings---Sub. Comm. on Conservation and Credit---Comm. on Agriculture. U. S. House of Representatives, June 23 and October 28, 1975, p. 1-69.

Descriptors: *Agricultural watersheds, *Environmental effects, *Cost-benefit analysis, *Flood control, *Federal project policy, Watersheds, Agricultural engineering, Water storage, Flood protection, Drainage engineering, Drainage effects, Drainage programs, Recreation, Diversion structures, Cost-benefit ratio, Land management, Grading, Surface drainage, Water conservation, Watershed management, Watershed Protect . and Flood Prev. Act, Federal government.
Identifiers: Environmental impact statements.

The Subcommittee on Conservation and Credit held approval hearings pertaining to twelve variously located watershed projects in June and October of 1975. Funding was considered for the following projects: Bayou Bonne Idee, La.; Bayou Plaquemine Brule, La.; East Franklin, La.; First Capital, Wis.; Flar Rock Creek, Ark.; Kickapoo Creek, Tex.; Kinder, La.; Newman Lake, Wash.; Norman-Polk, Minn.; Spring Canyon, Wyo.; Stoney Creek, N.C.; and Upper Brushy Creek, Ala. Information contained in the report includes project size and location, tributary involved, sponsors, watershed land use, number and size of farms served, and general project purposes. These projects are designed to provide watershed protection, flood prevention, drainage, recreation, and fish and wildlife improvements. Suggested measures range from soil conservation practices on farms, ranches, and woodlands, to structural techniques for storage, diversion, and retardation. Each project report includes an Environmental Impact Statement and a cost-benefit analysis consisting of a project costs and annual benefits breakdown. (Reinders-Florida)
W76-07866

DREDGING ON THE MISSOURI RIVER OXBOW LAKES.
Hearing--Sub. Comm. on Water Resources--Comm. on Public Works, U. S. Senate, September 29, 1975. p. 1-220.

Descriptors: *Missouri River, *Iowa, *Dredging, *Oxbow Lakes, *Rehabilitation, Federal government, Cost-benefit analysis, Conservation, Benefits, Capital costs, Cost analysis, Costs, Recreation, Recreation demand, Recreation facilities, Wildlife conservation, Cost sharing.
Identifiers: *Lake Manawa(Iowa).

The purpose of proposed bill S1799 is to authorize the Secretary of the Army to carry out dredging and related activities and shoreline stabilization work on the Missouri River, particularly upon Lake Manawa in the State of Iowa for the purpose of implementing state and public general improvement programs for recreational purposes. The Bill, if enacted, would require non-Federal interests to pay 50 percent of the costs, and that not less than 20 percent of affected lakes be made available for use by the general public. The Department of the Army recommended against passage of S1799 arguing the lack of a Federal study and the failure of a similar rehabilitation project at McCook Lake. The Hearings demonstrate the need for dredging, and utilize cost-benefit analysis to demonstrate the favorable effect of the renovation program within the region. Major parties interested in the Lake Manawa Dredging Project, including representatives of the U. S. Army Corps of Engineers and the Iowa Conservation Commission, met for discussion of S1799 on October 21, 1975 and resolved that the Interstate Commerce Commission and the Iowa Legislature favor the proposed cost-sharing approach, and that the Corps under Congressional direction participate in the dredging. (Hadoulias-Florida)
W76-07867

NATIONAL FLOOD INSURANCE ACT--1975.
Hearings---Sub. Comm. on Housing and Urban Affairs---Comm. on Banking, Housing and Urban Affairs, U. S. Senate, June 13, 23, 1975, p. 1-150.

Descriptors: *Local government, *Flood plain insurance, *Federal government, *Legislation, *Flood plain zoning, Insurance, Floods, Flood plains, Regulation, Non-structural alternatives, Flood protection, Building codes, Beneficial use, Land tenure, Land use, Land classification, Zoning, State governments, Administrative agencies.
Identifiers: *National Flood Insurance Act of 1968, Flood Disaster Protection Act of 1973, Administrative regulations.

The purpose of Senate Bill 810 is to amend the Flood Disaster Protection Act of 1973 and the National Flood Insurance Act of 1968 to permit owners of properties located in nonparticipating communities to participate in the flood insurance program. Supporters of the bill maintained that individuals are unfairly penalized by their community's failure to enact flood plain zoning. Furthermore, they alleged that government agencies have identified some areas incorrectly as flood hazard areas, that many unincorporated communities have no authority to enact zoning, and, that the present plan is difficult to administer. Opponents of the bill argued that the amendment is indefensible from a fiscal viewpoint and would frustrate the purpose of the act that the burden of flood relief should be on the flood prone property rather than all taxpayers, and, that flood protection on an individual basis would be a hit or miss method which might increase the severity of flooding for neighboring land. The record contains 3 tables relating to state flood control and flood zoning

acts. Also included are several substitute bills suggested by supporters. (Capehart-Florida)
W76-07868

CORPS OF ENGINEERS OVERSIGHT HEARINGS - 1975,
Hearings --- Sub Comm. on Water Resources -- Comm. on Public Works, U.S. Senate, May 9, 16, June 19, 20, and October 8, 1975, p. 1-1255.

Descriptors: *Federal project policy, *Decision making, *Engineering structures, *Navigable waters, *Federal jurisdiction, Channels, Canal construction, Inland waterways, Environmental effects, Planning, Permits, Railroads, Cost sharing, Locks, Water policy, Federal government.
Identifiers: *Administrative regulations.

The Senate Subcommittee on Water Resources has conducted hearings as part of a continuing investigation into the civil works program of the Army Corps of Engineers. The subcommittee is directing its oversight activities toward an in-depth scrutiny of the navigation program as conducted by the Corps. Questions have been raised recently regarding many waterway policies, especially traditional Federal navigation cost-sharing mechanisms. Legislation has been introduced which would remove the navigation program from Corps jurisdiction and place it under the Department of Transportation. The policy for replacement of obsolete locks and dams, in effect since 1909, is being questioned, along with the environmental effects of navigation improvements and the expansion of Corps permit authorities over navigable waters. These hearings are meant to help define these problem areas and aid in devising solutions. Testimony is presented from representatives of states, the Corps of Engineers, port interests, waterway carriers, environmentalists, and railroads. Consideration is given to S. 838 which would grant the Corps authority to delegate its permit authority to states with a permit system that is duplicative of the Corps program. (Reinders-Florida)
W76-07869

UNITED STATES V. BEATTY, INC. (GOVERNMENT RIGHT TO RECOVER EXPENSES FOR CLEANING UP OIL SPILLS),
401 F. Supp 1040-44 (WD Ky 1975). 5 p.

Descriptors: *Oil spills, *Oil pollution, *Compensation, *Kentucky, Ships, Judicial decisions, Legislation, Navigable waters, Water pollution sources, Pumping, Water pollution, Water policy, Coast Guard regulations, Legal aspects, Legal review, Damages, Penalties(Legal), Costs.
Identifiers: *Clean-up costs, Bilges.

This case arose when the captain of a ship went into town to purchase hardware equipment necessary to repair a broken fitting on the vessel's hull. In doing so, he left an inexperienced hand in charge of insuring that water from the bilge did not result in any discharge of oil. Unfortunately, between 5 and 10 gallons of oil were discharged into the river in the captains's absence. This discharge was discovered by the Coast Guard who contacted an oil company association to remove the oil from the water. The ship's captain returned after the clean-up operation had begun and protested that he had equipment to clean-up the spill at no cost to anyone. The Coast Guard ordered the association to continue the operation, however, since it was already on the scene. At a subsequent administrative hearing, the Coast Guard assessed the captain the clean-up costs paid by the plaintiff United States and also assessed a $2,000 fine. Defendant captain then appealed, contending that the fine was excessive and that the clean-up costs were unreasonable and unnecessary. In affirming the Coast Guard's decision the District Court held that even though the fine and clean-up expenses were somewhat high they were nevertheless within the limits of the law. (Hoffman-Florida)
W76-07870

UNITED STATES V. EUREKA PIPELINE CO. (PENALTY DETERMINATION UNDER FEDERAL WATER POLLUTION CONTROL ACT).
401 F. Supp. 934-43 (ND W. Va. 1975). 10 p.

Descriptors: *Penalties(Legal), *Federal Water Pollution Control Act, *Constitutional law, *Oil spills, Public rights, Oil pollution, Pipelines, Administrative agencies, Decision making, Legal aspects, Public rights, Water law, Legislation.
Identifiers: Equal protection, Civil penalties, Criminal penalties.

Plaintiff United States was seeking civil penalties against defendant pipeline company for violations of the Federal Water Pollution Control Act (FWPCA) arising out of unauthorized oil discharges. The defendant contended that the FWPCA violated the Fifth Amendment since it allowed information gathered under its reporting requirements to be used in assessing civil penalties. The FWPCA was also alleged to violate the equal protection clause since it allowed the appropriate agency to consider the size and stability of the violating business in determining the size of the penalty. The district court rejected these contentions, however, finding the Act to be constitutional. Although acknowledging that the Act creates a unique situation whereby a person can become automatically liable for a civil penalty by following the only route available to avoid criminal prosecution, the court nevertheless found this to be the Congressional intent in enacting the Act. Thus, since no criminal action was involved, the Fifth Amendment was not violated. The equal protection claim was also rejected since the Fifth Amendment, unlike the Fourteenth, does not prohibit discrimanatory action. Hence, no constitutional rights were infringed even if the Act did result in discrimination against established businesses. (Hoffman-Florida)
W76-07871

UNITED STATES V. GENERAL MOTORS CORP. (CRIMINAL AND CIVIL PENALTIES FOR OIL DISCHARGE INTO NAVIGABLE WATERS).
403 F Supp. 1151-65 (D. Conn. 1975). 15p.

Descriptors: *Navigable waters, *Oil spills, *Federal Water Pollution Control Act, *Third party effects, Judicial decisions, Legal aspects, Oil pollution, Water pollution sources, Penalties(Legal), Negligence, Oil, Industries, United States, Connecticut.
Identifiers: Clean-up costs, Strict liability, Criminal penalties, Civil penalties.

Defendent corporation had ceased operations of one of its plants and had drained oil storage tanks except for a reserve needed to protect machinery. Although the corporation continued to provide security for the plant, vandals managed to open valves on the tanks which resulted in an oil discharge into navigable waters. After the defendant refused to pay an oil-spill fine assessed against it, plaintiff United States brought this action to compel payment. The defendant contended that the Federal Water Pollution Control Act (FWPCA) does not authorize the imposition of a fine when the spill was the sole result of intentional misconduct by third parties. The defendant also contended that if the fine could be assessed, it should be a criminal penalty that could be enforced only in a criminal proceeding. The court rejected both contentions, however, holding that the FWPCA is based on a concept of strict liability which allows the imposition of a fine even in the absence of negligence. Because the defendant failed to introduce enough evidence to show that the fine constituted a criminal penalty the congressional intent to classify the fine as a civil penalty was held to be controlling. Despite the invalidity of the defendant's contentions, the court reduced the fine to a $1.00 nominal penalty. (HOffman-Florida)
W76-07872

STATE V. CALLAWAY (FEDERAL WATER POLLUTION CONTROL ACT).
401 F Supp 524-31 (D. Minn. 1975). 8 p.

Descriptors: *Degradation, *Federal Water Pollution Control Act, *Dredging, Federal jurisdiction, Regulation, Permits, Water quality control, Pollution abatement, State jurisdiction, Bodies of water, Water pollution control.
Identifiers: Notice requirements.

Plaintiff State was seeking a declaratory judgement that the Corps of Engineers must comply with applicable state laws governing pollution abatement in its dredging operations in state waters. The plaintiff contended that failure to comply with these laws would result in a serious degradation in the quality of state waters. Defendant Corps of Engineers contended that the court had no jurisdiction to grant relief since the notice requirements of the Federal Water Pollution Control Act (FWPCA) had not been met. The court rejected this contention, however, holding that the FWPCA makes it clear that Congress intended to expand federal jurisdiction. Consequently, compliance with the notice requirements was not found to be a prerequisite to federal jurisdiction. The defendant also contended that plaintiff was not entitled to judgement since federal agencies need not obtain state discharge permits. Furthermore, even if permits must be obtained as a general rule, section 1344 of the FWPCA exempts dredging operations from state regulation. The court rejected these contentions, holding that state permit systems are to be the primary enforcement mechanism of the Act and must be followed. Because the plaintiff had an approved permit system, the court held Section 1344 to be inapplicable and granted the requested declaratory judgement. (Hoffman-Florida)
W76-07873

LESLIE SALT CO. V FROEHLKE (NAVIGABLE WATERS OF THE U. S. AS EXTENDING LANDWARD TO THE MEAN HIGH WATER LINE).
403 F. Supp. 1292-98 (ND Cal 1974). 7 p.

Descriptors: *Federal jurisdiction, *Water management(Applied), *California, *Federal Water Pollution Control Act, *High water mark, Navigable waters, Construction, Permits, Jurisdiction, Legal aspects, Constitutional law, Legislation, Pacific coast region, Legal review, Administrative agencies, Federal government.
Identifiers: Mean high water line, Mean higher high water line.

Plaintiff landowners were seeking a declaratory judgement that the defendant Corps of Engineers does not have jurisdiction under the Federal Water Pollution Control Act (FWPCA) over land situated above the mean high water line (MHW). The plaintiffs sought this relief after the Corps informed them that it was asserting jurisdiction over plaintiffs' coastal property, and would require permits for any work done bayward of the mean higher high water line (MHHW). The defendant noted that case law has limited the Corps jurisdictional authority under the Rivers and Harbors Act to land situated below the MHW line. The Corps contended, however, that its jurisdiction under the FWPCA is not so limited, and that its regulations defining navigable waters as extending landward to the MHHW line for Pacific Coast purposes was a reasonable interpretation of its jurisdictional authority under the FWPCA. The court agreed with the Corps' contention, finding that the legislative history of the FWPCA indicated that the Act should be given its broadest constitutional interpretation, Thus, the court found that the Corps jurisdiction under the FWPCA extended to all

lands bayward of the MHHW line. (Hoffman-Florida)
W76-07874

DE GAYNER AND COMPANY V DEPARTMENT OF NATURAL RESOURCES (TEST FOR DETERMINING NAVIGABILITY OF A STREAM).
236 NW2d 217-24 (Wisc. 1975). 8 p.

Descriptors: *Wisconsin, *Diversion dams, *Navigable waters, *Beavers, Navigation, Permits, Administrative agencies, Decision making, Damsites, Streams, Construction, Area redevelopment, Administrative decisions, Judicial decisions.
Identifiers: Water depth, Artificial conditions.

Defendant riparian owner had proposed the damming up of a local creek so as to create an artificial lake around which it was going to construct a residential development. In an effort to prevent this damming, a local citizens group sought a declaratory judgment from the Department of Natural Resources that the creek in question was a navigable stream; and therefore, a permit was required before any construction could begin. After the Department found the creek to be navigable, the defendant appealed. The major issue was whether the Department was correct in considering the fact that beaver dams on the creek raised the water depth to a sufficient degree to allow navigability. The defendant contended that beaver dams are an artificial condition that comes and goes and should not be considered in determining navigability. Since several witnesses had testified that the creek was not navigable under normal conditions because of unsuitable water depth, the defendant contended it was entitled to judgment. The Wisconsin Supreme Court affirmed the decision, however, noting that beavers have existed on the creek for the last forty years. Because of this duration, the beaver dams were a part of the normal conditions of the creek, and were proper factors to be considered by the department. (Hoffman-Florida)
W76-07875

BOTSCH V LEIGH LAND COMPANY (ODORS FROM FEEDLOT LAGOON AS NUISANCE).
236 NW2d 815-18 (Neb. 1975). 4 p.

Descriptors: *Nebraska, *Lagoons, *Feed lots, *Reasonable use, *Cattle, Insects, Pollution abatement, Rural areas, Waste treatment, Waste water treatment, Judicial decisions, Legal aspects, Animal wastes(Wildlife), Nuisance algae.
Identifiers: Nuisance.

Plaintiff farmer brought an action seeking to enjoin defendant corporate cattle farmer from continuing operation of its feedlot. The plaintiff contended that waste treatment lagoons situated on defendant's land created a nuisance due to offensive odors, dust, and insects originating from the lagoons. After the trial court dismissed the complaint, plaintiff appealed. Although conceding that a business enterprise is not a nuisance per se, the plaintiff contended that the severity of the conditions caused by defendant's lagoons was sufficient to make the feedlots operations a nuisance in fact. The defendant, however, argued that its feedlot located in a rural area containing several cattle-feeding operations, and thus could not be a nuisance. Although agreeing that enterprises have much more leeway in rural areas, the appellate court found that certain minimum levels must still be maintained. In this case, the court found that the odors and insects originating from the lagoons exceeded acceptable limits. Thus, the case was remended for a determination of whether the lagoons could be operated in a manner that would sufficiently abate the problems caused. (Hoffman-Florida)
W76-07876

GETKA V LADER, JR. (REASONABLE USE RULE ELIMINATING COMMON ENEMY DOCTRINE).
238 NW2d 87-94 (Wisc. 1976). 8 p.

Descriptors: *Adjacent land owners, *Wisconsin, *Surface drainage, *Reasonable use, *Culverts, Surface runoff, Surface waters, Standing waters, Judicial decisions, Reservoirs, Legal aspects, Common law, Drainage, Drainage area, Drainage patterns.
Identifiers: Common enemy doctrine, Injunctive relief.

Plaintiff landowners brought this action seeking to enjoin defendant adjacent landowners from continuing to drain water off their land into a culvert that brought water onto plaintiff's land. Plaintiffs contended that this excess drainage caused water to stand in depressions on their land, thus making it impossible to cross such areas with a tractor. After a judgment in favor of the plaintiffs, the defendants appealed. In addressing this case, the appellate court noted that Wisconsin had recently adopted a 'reasonable use' test to determine the rights of landowners to drain surface water from their land. Because that rule was made prospective only, however, the court found the common enemy doctrine to be the controlling test. Under that doctrine, landowners have the right to cause surface waters to drain off their land onto adjoining land if the water flows in a natural course of drainage. Although recognizing that the discharge of water from a reservoir was an exception to the doctrine, the court found that diverting water through a culvert did not come within this exception. Consequently, since the drainage water flowed in a natural course, the court reversed the trial court decision. (Hoffman-Florida)
W76-07877

OMERNICK V. DEPT. OF NAT RESOURCES (STATUTORY PRIOR RIGHT SUPERSEDING COMMON LAW DOCTRINE OF REASONABLE USE).
238 NW2d 114-16 (Wisc. 1975). 3 p.

Descriptors: *Irrigation permits, *Wisconsin, *Diversion, *Riparian rights, *Constitutional law, Water rights, Judicial decisions, Administrative agencies, Decision making, Classification, Legislation, Legal aspects, Irrigation, Irrigation water, Streams, Trout, Permits.
Identifiers: Surplus waters.

Plaintiff potato farmers proposed to divert water from a local stream to irrigate their land. After defendant Commission prevented such action until a permit was obtained, the plaintiffs brought suit, contending that the Commission had made the permit statute applicable by designating the stream as a trout stream without affording the plaintiffs an opportunity to be heard. The plaintiffs also alleged a denial of due process since the statute provided no means to determine the rights of riparian owners, yet granted such owners who were beneficially using the stream waters a veto power, without any showing of injury, over the granting of an irrigation permit. After the trial court sustained defendant's demurrer, the plaintiffs appealed. The Wisconsin Supreme Court rejected the plaintiffs' claim that a hearing was required since the effect of a trout designation pertained only to surplus waters. In this case there was no allegation that the water to be diverted was surplus. The Court also found that the statute was not unconstitutional because it granted certain riparian owners a veto power. The court noted that the statute indicated a legislative intent to abrogate the common law riparian right of irrigation by substituting a statutory permit procedure. Thus, the decision was affirmed. (Hoffman-Florida)
W76-07878

WILBER V. WHEELER (PRIOR VESTED RIGHTS NOT IMPAIRED BY SUBSEQUENT ISSUANCE OF WATER RIGHT CERTIFICATE).
543 P2d 1052-58 (Ore. 1975). 7 p.

Descriptors: *Oregon, *Irrigation, *Irrigation permits, *Water distribution(Applied), Irrigation practices, Irrigation water, Water law, Legal aspects, Permits, Irrigated land, Water rights, Judicial decisions, Legal review, Distribution systems, Irrigation systems, Regulation.

Plaintiff landowner brought a mandamus proceeding against defendant state engineer to require the defendant to issue a corrected certificate of water rights on certain lands owned by the plaintiff. In 1941, the plaintiff's predecessor in interest had received a permit to irrigate 167.1 acres of land, although the final proof survey in 1954 showed that 219.6 acres were being irrigated, some of which did not belong to the plaintiff's predecessor. A 1956 certificate of water right for 167.1 acres included only the uppermost 167.1 acres of the 219.6 shown, 17 of which were owned by a third party. The plaintiff contended this was a clerical error and sought correction. The Supreme Court of Oregon disagreed, holding that Oregon statutory law made certificates of water right issued by a state engineer conclusive evidence of title to water rights unless a contest was brought within three months of issuance. The Court went on to note, however, that persons could apply for water rights to lands which they do not own but which they intend to irrigate. (Welch-Florida)
W76-07879

BUDD V. BISHOP (LIMITATION TO BENEFICIAL USE OF WATER RIGHTS OF ANY APPROPRIATOR).
543 P2d 368-73 (Wyo. 1975). 6 p.

Descriptors: *Wyoming, *Prior appropriation, *Competing uses, *Irrigated land, *Irrigation, Regulated flow, Regulation, Water allocation(Policy), Water utilization, Water law, Legal aspects, Adjudication procedure, Preferences(Water rights), Diversion, Priorities, Proration, Appropriation, Water rights.
Identifiers: Standing(Legal).

Plaintiff water rights owner brought this action to challenge the interpretation given to the state surplus water law by defendant state officers. The plaintiff further challenged the constitutionality of the statute. The surplus water statute was enacted to provide for the vesting of the right to use excess stream water among several appropriators. The statute limited the amount and uses of water to be appropriated and vested surplus water use priority to those rights acquired before March 1, 1945. The Supreme Court of Wyoming remanded the case, ordering the deletion of the lower court's conclusion of law that the statute was constitutionally valid. Furthermore, it held that the plaintiff had no standing to challenge the constitutionality of the surplus water law where his rights were obtained in accordance with such law. The plaintiff could not challenge surplus water law by contending there were state constitutional violations relating to water rights for storage of water when the plaintiff himself did not hold such rights. (Welch-Florida)
W76-07880

COMMONWEALTH DEPARTMENT OF ENVIRONMENTAL RESOURCES V METZGER (MAXIMUM LEVEL OF GROUND WATER AT LEAST FOUR FEET BENEATH EXCAVATION FOR SEWER).
347 A2d 743-46 (Pa. Com. Ct. 1975). 4 p.

Descriptors: *Pennsylvania, *Pollution abatement, *Water pollution control, *Sewage disposal, Waste disposal, Sewage, Sewerage, Waste water, Sanitary engineering, Legal aspects, Judicial review, Administrative agencies, Administrative

decisions, Building codes, Control, Governments, Standards, Water quality standards, Design standards.
Identifiers: Administrative regulations.

Plaintiff appellant builder brought this action against defendant to overturn a permit disapproval concerning installation of a sewage disposal system. Local authorities had disapproved plaintiff's permit for failure to comply with state environmental quality standards. Plaintiff contended that evidence of standards met in nearby excavations showed that quality standards in the area were met and alternatively that such standards, when not reasonably related to pollution control, were an unlawful exercise of police power. The Commonwealth Court of Pennsylvania found that the administrative regulations were subject to the same heavy burden of proof required to invalidate legislation and that this burden was not met. The plaintiff had the burden to show compliance with state regulations beneath the proposed excavation, and his testimony concerning nearby excavations was insufficient to do so in the absence of additional evidence establishing the existing soil condition beneath the proposed site. (Welch-Florida)
W76-07881

BILMONT V. UMPQUA SAND AND GRAVEL, INC. (DETERMINATION OF BOUNDARY LINE LOCATED IN RIVER BED TO FIND HOW MUCH GRAVEL HAD BEEN TAKEN).
542 P2d 884-92 (Ore. 1975). 9p, 1 map.

Descriptors: *Oregon, *Boundaries(Property), *Gravels, *Boundary disputes, *River beds, Adjacent land owners, High water mark, Ownership of beds, Legal aspects, Water law, Water rights, Banks, Rivers, Streambeds, Streams, Judicial decisions, Legal review, Dredging.

Plaintiff land owner brought this action to recover the value of river gravel alleged to have been removed from his property by defendant adjacent land owner. The plaintiff and the defendant each owned adjoining parcels of land along a non-navigable stream. The defendant alleged that gravel was taken from his portion of the river bed and that any gravel taken from the plaintiff's portion was in exchange for topsoil delivered to the plaintiff. The major issue at trial involved the interpretation of the phrase 'bank of the river' which was used in the plaintiff's deed. The Supreme Court of Oregon disagreed with the trial court, and held that since this was a non-navigable stream, 'bank' did not refer to the high water mark but to the middle or thread of the stream. The Court went on to hold that the disputed boundary line in the river bed would be established by extending a perpendicular line from the thread of the terminus of the plaintiff's upland line at the high water mark. The case was remanded, however, to determine if there had been any willful confusion of the gravel rights by the defendant. (Welch-Florida)
W76-07882

COMMONWEALTH DEPT OF ENVIRONMENTAL RESOURCES V CITY OF LEBANON (IF FLUORIDATION NOT A PREREQUISITE FOR ISSUANCE OF WATER SUPPLY PERMIT, THEN CANNOT BE FOR MODIFICATION THEREOF).
348 A2d 166-69 (Pa Com Ct 1975). 4 p.

Descriptors: *Pennsylvania, *Fluoridation, *Water supply, *Public health, *Water permits, Water treatment, Fluorides, Fluorine, Treatment, Public health, Supply, Water yield, Legal aspects, Permits, Water law, Administration, Regulation, Water allocation(Policy), Water resources development, Judicial decisions.
Identifiers: Administrative regulations.

Appellant city appealed an Environmental Hearing Board order which had upheld appellee Department of Environmental Resources' refusal of appellant's request for a modification of the city's water supply permit to discontinue fluoridation. Appellant had been issued a water supply permit in 1970 which had recited the city's intent to fluoridate the water supply. In 1973 the city had requested the modification which was refused. Appellee contends that statutory authority vests the appellee with discretionary powers to determine issuance and modification of water permits according to its own determination of conditions which are not 'prejudicial to the public health'. The Commonwealth Court held that appellee could not refuse the permit modification on the grounds of public health in view of the fact that fluoridation was not a precondition for the initial issuance of a water permit and thus its absence in a water supply could not be deemed prejudicial to public health. (Welch-Florida)
W76-07883

LOVELADIES PROPERTY OWNERS ASS'N V. RAAB (FILING OF WETLANDS MAP PREREQUISITE TO REGULATION OF LANDS UNDER WETLANDS ACT OF 1970).
348 A2d 540-43 (NJ Superior Ct 1975). 4 p.

Descriptors: *New Jersey, *Permits, *Wetlands, *Land reclamation, *Land management, Marshes, Conservation, Reclamation, Coastal marshes, Coastal engineering, Regulation, Administrative agencies, Administrative decisions, Maps, Mapping, Legal aspects, Control, Legislation, Preservation.
Identifiers: Administrative regulations, Fill permits, Injunctive relief.

Plaintiff property owners' association brought this action seeking a declaration that defendant property owners' lands were wetlands within the meaning of the New Jersey Wetlands Act of 1970. The plaintiffs also sought an injunction to restrain the defendant from depositing fill on the lands and to compel him to restore the lands to their previous condition. The defendant had filled part of his lands, which had been designated as wetlands on the Act's required map, subsequent to the proper filing of the map but prior to the Department of Environmental Protection's order which provides for permits for regulated activities upon such wetlands. The Superior Court held that coastal wetlands were not exempt from the Act's requirements. The court held, however, that coastal wetlands were not exempt from the Act's requirements. The court also held, however, that the activities subject to regulation are not prohibited until a wetlands map has been filed and an order promulgated. Thus the plaintiff's action was dismissed. (Welch-Florida)
W76-07884

SANDS POINT HARBOR, INC. V. SULLIVAN (REGULATION OF USE OF MARSHES AND WETLANDS: VALID EXERCISE OF GOVERNMENT POWER).
346 A2d 612-14 (NJ 1975). 3 p.

Descriptors: *New Jersey, *Wetlands, *Marshes, *Regulation, *Constitutional law, Conservation, Legislation, Legal aspects, Coastal marshes, Land reclamation, Governments, State governments, Land, Administrative decisions, Land management, Water law, Preservation.
Identifiers: Administrative regulations.

Plaintiff property owner brought this action to challenge orders adopted by defendant Department of Environmental Protection pursuant to the New Jersey Wetlands Act. The plaintiff contended that the orders promulgated so regulated the use of wetlands and marshes as to deprive him of constitutionally guaranteed equal protection and that such regulations were an unconstitutional taking of property without just compensation. The New Jersey Superior Court held that the regulations concerned environmentally Important lands and were a valid exercise of governmental power. The court Further held that the geographic scope of coastal wetlands did not isolate equal protection because there were reasonable grounds for the different treatment of lands in different areas of the state. Since the plaintiff had demonstrated no practical use of his lands according to statutory procedures, he failed to show that any taking had occurred. (Welch-Florida)
W76-07885

IN RE WILDLIFE WONDERLAND, INC. (VERMONT ENVIRONMENTAL BOARD FINDINGS OF POSSIBLE GAME FARM WATER POLLUTION ENOUGH TO DENY PERMIT).
346 A2d 645-54 (Vt. 1975). 10 p.

Descriptors: *Vermont, *Land use, *Permits, *Land development, *Legal review, *Water pollution, Soil erosion, Water law, Conservation, Legislation, Legal aspects, Erosion, Erosion control, Land, Soil management, Water management(Applied), Administrative agencies, State governments, Land management.
Identifiers: Administrative regulations, Standing(Legal).

Wildlife Wonderland, Inc. filed an application for a land use permit authorizing the construction and operation of a commercial game farm. After the District Environmental Commission granted the permit, environmental opponents appealed to the Vermont Environmental Board which disapproved the permit. Wildlife contended that the alleged pollution which would result from such construction and operation was not supported by substantial evidence and that the board was considering matters beyond its powers. The Supreme Court of Vermont held that while particular comments in the findings indicated the Board had overstepped its jurisdiction, no reversible errors had been committed. The court further held that substantial evidence of potential pollution had been submitted to the Board which supported its conclusions and denial of a land use permit. (Welch-Florida)
W76-07886

COMMONWEALTH DEPARTMENT OF ENVIRONMENTAL RESOURCES V. FLEETWOOD BOROUGH AUTHORITY (CRIMINAL ASSESSMENT AGAINST BOROUGH FOR VIOLATION OF CLEAN STREAMS LAW).
346 A2d 867-69 (Pa. Com. Ct. 1975). 3p.

Descriptors: *Pennsylvania, *Pollution abatement, *Streams, *Penalties(Legal), *Water pollution control, Control, Regulation, Legal aspects, Judicial decisions, Law enforcement, Water law, Legislation, Water quality, Water quality standards, Waste water disposal, Waste water(Pollution), Water pollution, Water quality control, Abatement, Organic wastes, Fishkill, Sewage effluents.
Identifiers: Nuisance(Legal aspects), Pennsylvania Clean Streams Law.

Plaintiff Commonwealth Department of Environmental Resources brought action against defendant borough authority for violation of the state Clean Streams Law. The defendant admitted that a fish kill occurred as a result of a violation of the terms of its sewer permit which required the removal of 85% of the organic pollution load from final effluents discharged into a certain stream. Despite this admission, defendant contended that its activities were only a nuisance under the Clean Streams Law, and thus were not punishable under the criminal abatement remedies of the Law. The Commonwealth Court of Pennsylvania found that defendant had violated its permit and discharged substances for which it had no permit, both of which constituted a violation of the Clean Streams Law. In addition, the defendant was found liable under both the criminal and abatement remedies sections since the stated purpose of the Law was to provide additional remedies to abate the pollution of state waters.

W76-07887

COMMONWEALTH DEPARTMENT OF ENVIRONMENTAL RESOURCES V MONONGAHELA AND OHIO DREDGING COMPANY (INSURANCE OF CEASE AND DESIST ORDER TO DREDGING COMPANY WITHOUT A HEARING NOT A DENIAL OF DUE PROCESS).
346 A2d 879-84 (Pa. Com. Ct. 1975). 6 p.

Descriptors: *Water pollution abatement, *Pennsylvania, *Navigable rivers, *River regulation, *Dredging, River flow, Regulation, Legal aspects, Administrative agencies, Running waters, Surface waters, Administration, State governments, Water rights, Administrative Decisions, Water law, Constitutional law, Navigable waters, Judicial decisions.
Identifiers: Administrative regulations, Navigation obstructions.

Plaintiff Department of Environmental Resources brought this action to enforce a cease and desist order restraining defendant dredging company from acts which would violate the Water Obstructions Act by changing a cross section of the Allegheny River. The defendant contended that the plaintiff did not have authority to issue orders against dredging companies performing maintenance dredging, and that the facts did not justify the issuance of the order. The Commonwealth Court of Pennsylvania held that the state legislature can determine what can be done with the soil at the bottom of navigable streams. Furthermore, this power, as reflected in the Water Obstructions Act, gave authority to the plaintiff to issue a cease and desist order if such order was supported by facts sufficient to show a violation of the Act. The expert testimony offered in this case was found to be sufficient to support findings of fact that activities of the defendant would change a cross section of the river in violation of the Act. The Court also found that the defendant was not denied a due process hearing in that the hearing was convened before the board and the defendant could have challenged the order at that time. (Welch-Florida)
W76-07888

CITY OF CONCORD V WATER SUPPLY AND POLLUTION CONTROL COMMISSION (ORDER TO COVER OPEN HIGH SERVICE DISTRIBUTION RESERVOIR NOT UNREASONABLE).
347 A2d 173-74 (NH 1975). 2 p.

Descriptors: *New Hampshire, *Water supply, *Water pollution, *Bacteria, *Reservoirs, Reservoir storage, Reservoir operation, Reservoir construction, Water sources, Water tanks, Water resources, Water quality, Water quality standards, Water pollution control, Water pollution sources, Legal aspects.

Plaintiff city appealed an order from the defendant Water Supply and Pollution Control Commission which had required the plaintiff to cover its high service distribution reservoir. The Commission had found that the plaintiff's reservoir was a source of bacterial and viral contamination of the city's water distribution system. Expert testimony showed that the reservoir was open to pollution from sea gulls, water fowl and humans. The defendant contended that records of actual bacteriological counts taken from the reservoir for the years at issue were not introduced. The Supreme Court of New Hampshire held that the order was not unreasonable in view of the evidence and that the Commission properly relied upon testimony of its staff experts in determining the necessity of such an order. (Welch-Florida).
W76-07889

COMMONWEALTH DEPT. OF ENVIRONMENTAL RESOURCES V MILLS SERVICE, INC. (ABUSE OF DISCRETION BY ENVIRONMENTAL HEARING BD IN DETERMINATION OF POLLUTING PENALTY).
347 A2d 503-07 (Pa Com Ct 1975). 5 p.

Descriptors: *Permits, *Waste treatment, *Waste disposal, *Pennsylvania, *Penalties(Legal), Facilities, Streams, Administrative agencies, Discharge(Water), Industrial wastes, Legal aspects, Pollution abatement.

After the operator of an industrial waste treatment facility was found to have allowed an unauthorized discharge of waste into a creek in violation of the Clear Streams Act, the Environmental Hearing Board revoked the facility's waste permit. The facility appealed this decision, contending that the revocation was an excessive penalty. The facility noted that only one isolated discharge was involved in the violation, and that the operator had taken immediate action after the discharge to prevent further discharges. While acknowledging that the discharge violated the Act, the facility stressed that the violation was the unintentional result of a negligent omission from its permit application. The Environmental Board, however, contended that an intentional violation is not a prerequisite for the exercise of its revocation power. The court rejected this contention, finding that the intent of the violator is a relevant issue. In this case, the court found that there was not sufficient evidence showing intentional misconduct to justify the imposition of such a harsh penalty. Consequently, the facility's permit was reinstated. (Hoffman-Florida)
W76-07890

LEHAN V. COMMONWEALTH DEPT. OF TRANSPORTATION, (DISCHARGE OF WASTE MATERIALS ONTO LAND OWNER'S PROPERTY NOT A DEFACTO TAKING BY STATE).
349 A2d 492-93 (Pa. Com. Ct. 1975). 2 p.

Descriptors: *Pennsylvania, *Adjacent land owners, *Ditches, *Sewerage, *Eminent domain, Drainage, Trespass, Negligence, Third party effects, Waste disposal, Judicial decisions, Wells, Water pollution, Highways, State governments.

Defendant state maintained a ditch that ran along a state highway. For a number of years, plaintiff landowners' neighbors discharged sewage materials into the highway ditch which ran across the plaintiffs' land. This sewage discharge caused the pollution of plaintiffs' well and other distasteful conditions. After the state refused to prohibit the neighbors' discharges the plaintiffs brought suit for the value of their land, contending that the pollution from the ditch constituted a de facto taking. After the lower court found the plaintiffs' allegations to constitute a cause of action, the state appealed, contending that any redress should be in a trespass action rather than an eminent domain proceding because the property damage involved was the result of the negligent conduct of third parties. The court found the state's contention to be well supported by recent state case law and thus dismissed the plaintiffs' petition. (Hoffman-Florida)
W76-07891

REDEVELOPMENT AUTHORITY V. SPENCER (TAKING OF PROPERTY IN FLOOD PREVENTION PROGRAM).
350 A2d 442-45 (Pa Com Ct 1976). 4 p.

Descriptors: *Constitutional law, *Flood protection, *Condemnation, *Pennsylvania, *Damages, Flood control, Legal aspects, Judicial decisions, Eminent domain, Public rights, Water law, Adjacent landowners, Compensation, Constitutional law, Real property.
Identifiers: Equal protection.

In order to implement a flood prevention project, a redevelopment authority was exercising its power of eminent domain over a large land area. Defendant landowners, who operated a junkyard on their premises, raised several objections to the taking of their land including that the taking was for a private rather than public purpose and thus should be prohibited. After a decision in favor of the state, the landowners appealed. In addition to the private purpose defense, the landowners contended that the damages allowed under the condemnation statute violated their equal protection rights. The appellate court rejected these contentions, however, finding the landowners first contention to be without merit since no evidence had been introduced to show that governmental authorities had implemented the flood project in an arbitrary, capricious or illegal manner. As to the question of damages, the court found that the statute awarding landowners the pre-condemnation value of their land did not violate their equal protection rights. The fact that some landowners may receive some additional compensation did not impair the defendant's constitutional right to just compensation. (Hoffman-Florida)
W76-07892

STATE V LANG (TIDAL WETLANDS ACT INAPPLICABLE TO PROPERTY WHERE TIDE MUST BE ARTIFICIALLY INDUCED INTO DITCHES).
375 NYS2d 941-45 (Sup Ct 1975). 5 p.

Descriptors: *New York, *Wetlands, *Landfills, *Dredging, *Tidal marshes, Industrial plants, Coastal marshes, Environmental effects, Judicial decisions, Legal aspects, Terrestrial habitat, Aquatic habitat, Industrial plants, Coasts, Real property.

Defendant landowner was charged with altering tidal wetlands on his property in violation of the Tidal Wetlands Act. Plaintiff state subsequently instituted this action to enjoin the defendant from any further filling or dredging activities. The defendant contended that any wetlands on his property were artificially created by industrial activities on adjoining lands; consequently, since the land did not contain natural wetlands, the Act was inapplicable. The defendant stressed that his land consisted of only a one-acre tract in the middle of a large tract of industrially developed lands. In dismissing the state's action, the court noted that the purpose of the Act is to prohibit wetland activities that would have an adverse effect on the marine terrestrial environment. Since this objective would not be advanced by enjoining future actions by the defendants, the plaintiff's complaint was found to be without mint. (Hoffman-Florida)
W76-07893

GRINNELL V KOWARC (CONSTRUCTION OF LAKESIDE DOCK DEPENDENT UPON PROPERTY OWNERSHIP).
376 NYS2d 759-60 (Sup Ct 1975). 2 p.

Descriptors: *Encroachment, *Construction, *New York, *Docks, *Land tenure, Permits, Judicial decisions, Real property, Legal aspects.

Both parties to this action had licenses allegedly giving them the authority to construct lakeside docks at the same location. When both parties attempted to construct docks, one of the licensees brought an action to remove encroachment by the other licensee. After judgement was granted to the plaintiff, the defendant appealed. The appellate court reversed and remanded, finding that the rights of the parties could not be resolved until the ownership of the land could be determined. Until such ownership is determined, both parties would be viewed as squatters since there was no evidence that the licensor had the authority to grant a license. (Hoffman-Florida)
W76-07894

TORTOLANO V. DIFILIPPO (LANDOWNER'S ALTERATION OF LAND GRADE CAUSING

DAMAGE TO ADJOINING LAND IMPOSING AFFIRMATIVE DUTY TO CHANGE AGAIN).
349 A2d 48-53 (RI 1975). 6 p, 1 append.

Descriptors: *Adjacent land owners, *Landfills, *Retaining walls, *Excess water, Flow, Land tenure, Damages, Reasonable use, Judicial decisions, Drainage water, Runoff, Graded, Gradients(Streams), *Rhode Island, Drainage effects, Drainage patterns(Geologic).
Identifiers: Common enemy doctrine.

Plaintiff landowner brought suit to enjoin a neighboring landowner to construct a retaining wall to prevent debris-carrying water from flowing across defendant's property onto plaintiff's land. This debris was allegedly the result of a filling operation that raised the level of defendant's land 12 to 14 feet above the natural grade resulting in a large increase in the flow of water across his land. After a judgement in favor of the plaintiff, the defendant appealed, contending that the 'common enemy' doctrine permitted his allegedly reasonable use of his property. The Rhode Island Supreme Court rejected this contention, however, finding that the plaintiff's claim was based on damages caused by the deposit of debris and silt on his property. The common enemy doctrine was thus inapplicable. The court then went on to discuss the measure of damages. (Hoffman-Florida)
W76-07895

PEOPLE V. AMERADA HESS CORP. (RIPARIAN RIGHT TO BUILD WALL TO PREVENT EROSION OF BOUNDARY).
375 NY 52d 1001-05 (Crim. Ct. N. Y. City 1975). 5p.

Descriptors: *New York, *Landfills, *Concretes, *Navigable waters, *Boundary disputes, State jurisdiction, Streams, Boundaries(Property), High water mark, Water pollution control, Riparian rights, Legal aspects, Water law, Navigation, Real property, Siltation.

Plaintiff State brought this action against defendant corporation for the allegedly unauthorized filling in of waterfront property in violation of statutory provisions. The defendant was charged with dumping broken concrete into the water and along the bank of a navigable creek in order to extend its property line. Defendant contended that its actions did not constitute a filling operation since the concrete was placed on the bank above the high water mark to prevent pollution by material silting and was not designed and did not result in extending the boundary line. Before discussing the facts of the case, the count noted that the State has the authority to regulate navigable waters and to prevent actions that will impair navigability. The statutory provision involved in this case was promulgated pursuant to that authority. The provision, however, was not meant to prevent a riparian owner from improving and protecting his property so long as any improvement did not interfere with navigability. Consequently, since no evidence was introduced showing that navigability was impaired, the action was dismissed. (Hoffman-Florida).
W76-07896

TRUSTEES OF THE FREEHOLDERS AND COMMONALITY V HEILNER (PUBLIC EASEMENT IN SURFACE OF NAVIGABLE BAY).
375 NYS2d 761-76 (Sup. Ct. 1975). 16 p.

Descriptors: *New York, *Landfills, *Boundaries(Property), *Easements, *Coasts, *Public access, Contract, Right-of-way, Accretion, Environmental effects, High water mark, Avulsion, Access routes, Navigable waters, Erosion, Boundary disputes, Public rights, Public lands.
Identifiers: Coastal property.

Defendant builder had entered into a contract to purchase coastal property on which he planned to construct a motel. Because of environmental concerns, plaintiff town sought to enjoin the defendant from filling in the land below the high-water mark. The town also sought a declaratory judgment describing the boundary lines of town lands abutting the shoreline of the land in question and declaring the existence of a public easement across such lands. After a complete analysis of applicable general principles, the court determined that the bay waters in question were navigable. Consequently, the defendant had title to the farthest seaward boundaries of the deed except as to land lost by erosion or gained by accretion. The defendant was also held to have the rights to fill in land lost by avulsion if original boundary lines could be determined, such fill-in right not to apply to land lost by erosion. As to the easement contention, the court held that the public has an easement over all land seaward of the high water mark. In this case, however, the public was deemed not to have an easement granting access to such land across the defendant's property. Thus, the plaintiff's complaint was dismissed in its entirety. (Hoffman-Florida).
W76-07897

WEISZMANN V. DIST. ENGINEER, U. S. ARMY CORPS OF ENGINEERS (JURISDICTION OF CORPS OF ENGINEERS OVER LANDLOCKED CANAL IN RESIDENTIAL SUBDIVISION).
526 F2d 1302-06 (5th Cir 1976). 5 p.

Descriptors: *Florida, *Federal jurisdiction, *Navigable waters, *High water mark, *Canals, Sedimentation, Navigation, Area redevelopment, Legislation, Legal aspects, Land tenure, Bodies of water, Rivers and Harbors Act, Permits, Legal review.
Identifiers: Commercial Navigation.

Plaintiff developer brought an action seeking to enjoin the Corps of Engineers from exercising jurisdiction over two canals dug by the developer in connection with a residential subdivision. After an unfavorable judgment, the plaintiff appealed, contending that the canals were situated on private land above the mean high tide level and were thus outside of the jurisdiction of the Corps under the Rivers and Harbors Act. The plaintiff also contended that jurisdiction was lacking since the canals were not navigable waters by reason of their limited non-commercial use, and that even if they were navigable waters, they had no effect on the course or condition of any other navigable waters. The Fifth Circuit Court rejected plaintiff's first contention, finding that the MHTL jurisdictional limitation was merely an internal Corps policy, and was not contained in the Act. The court found, however, that the Corps had jurisdiction over only one canal, because the other canal did not connect to any body of water and was thus outside the scope of the Act. The court went on to find that the jurisdictionally covered canal did have an effect on a navigable body of water in that it caused sediment to enter a pre-existing canal. Finally the court held that the canal need not actually carry commerce to meet the test of navigability. Thus, the decision was affirmed in part and reversed in part. (Hoffman-Florida).
W76-07898

UNITED STATES V. SEXTON COVE ESTATES, INC. (DREDGING SHOREWARD OF THE MEAN HIGH TIDE LINE: PROHIBITIONS OF THE RIVERS AND HARBORS ACT).
526 F2d 1293-1301 (5th Cir. 1976). 9p.

Descriptors: *Florida, *Rivers and Harbors Act, *Canals, *Federal jurisdiction, *Navigable waters, Constitutional law, High water mark, Legislation, Area redevelopment, Construction, Penalties(Legal), Legal review, Administrative agencies, Federal government.
Identifiers: Restoration, Personal liability.

Plaintiff United States brought this action seeking to require defendant corporate residential developer to restore ten canals, all of which were allegedly altered in violation of the Rivers and Harbors Act, to their original condition. After a judgement in favor of the plaintiff, the defendants appealed. The defendant set forth the following defenses: the Corps of Engineers had no jurisdiction since the canals were above the mean high tide line (MHTL); there was no violation of the Act; there was no statutory basis for holding the president personally liable for the restoration; and the restoration relief granted was inappropriate. The Fifth Circuit court found that MHTL jurisdictional limitation was not contained in the Act, but was an internal Corps policy. Thus, the Corps could exercise jurisdiction. The court also found, however, that the construction of five of the canals did not affect any navigable waters and thus did not violate the Act. Furthermore, the Act did not authorize the imposition of personal liability on a corporate official. Because of the uncertainty involved in awarding relief in environmental cases, the case was remanded for a hearing on whether the order of restoration was an appropriate and equitable form of relief. (Hoffman-Florida)
W76-07899

JOSEPH G. MORETTI, INC. V. HOFFMAN (AFTER-THE-FACT DREDGE AND FILL PERMITS).
526 F2d 1311-14 (5th Cir 1976). 4 p.

Descriptors: *Florida, *Dredging, *Permits, *Administrative agencies, *Federal jurisdiction, Decision making, Legal aspects, Administrative decisions, Legal review, Judicial decisions, Adoption of practices, Landfills, Federal government.
Identifiers: *Dredge permits, *Procedural requirements(Legal), Delegation, Discretionary authority.

Plaintiff residential developer was seeking to obtain an after-the-fact dredge and fill permit from the Corps of Engineers. After the Corps' denial of permit was upheld by the trial court, the plaintiff appealed, contending that they had refused to consider evidence favorable to the plaintiff and that the decision was not supported by substantial evidence. In addition, the plaintiff contended that the Secretary of the Army acted in error when he refused to review the recommendation to deny the permit. The court rejected the above contentions, however, and affirmed the decision. The court held that the Secretary of the Army has the statutory authority to delegate his discretionary authority to the Chief of the Corps of Engineers and therefore was not required to review the decision of the Corps. The court also found that the Corps was justified in excluding certain of plaintiff's documents from its records since those documents were of dubious relevancy. Finally, the court held that the administrative record contained sufficient evidence to justify the Corps' denial of the permit. (Hoffman-Florida)
W76-07900

UNITED STATES V. JOSEPH G. MORETTI, INC. (JURISDICTION OF THE CORPS OF ENGINEERS OVER CANALS CONSTRUCTED ABOVE MEAN HIGH TIDE LINE).
526 F2d 1306-1311 (5th Cir 1976). 6 p.

Descriptors: *Rivers and Harbors Act, *Florida, *High water mark, *Penalties(Legal), *Dredging, Permits, Administrative agencies, Administrative decisions, Constitutional law, Legislation, Judicial decisions, Legal review, Federal jurisdiction.
Identifiers: Restoration, After-the-fact permits.

Plaintiff United States sought to enjoin defendant developer from conducting dredge and fill work in Florida Bay. After the trial court granted the injunction, the defendants appealed, contending that it had not violated provisions of the Rivers and

Harbors Act, and that even if violations were found to exist, the trial court had no authority to order the restoration of the land fill area. Although the Fifth Circuit rejected these contentions, it found that the defendant had not been given its statutory right to pursue an after-the-fact permit. Subsequently, when the Corps of Engineers denied the after-the-fact permit, the defendant appealed to the trial court which affirmed. This time, however, the trial court revised its order so that the defendant was required to restore land both bayward and landward of the mean high tide land (MHTL). The defendant once again appealed, contending that the restoration order pertaining to areas above the MHTL were invalid since the Corps did not have jurisdiction over such areas under the Rivers and Harbors Act. The court rejected this argument, finding that the MHTL jurisdictional limitation was merely an internal Corps policy and was not mandated by the Act. Thus, the Corps had jurisdiction. The case was again remanded, however, for an evidentiary hearing on the manner of restoration to be carried out. (Hoffman-Florida)
W76-07901

SARASOTA COUNTY V. GEN DEV CORP (ENVIRONMENTAL LAND AND WATER MANAGEMENT ACT OF 1972 NOT EFFECTING COUNTY AUTHORITY TO CHALLENGE CITY ZONING).
325 So2d 45-7 (2d DCA Fla 1976). 3 p.

Descriptors: *Land development, *Administrative agencies, *Zoning, *Local governments, Land management, Land use, Water policy, Water law, Administration, Jurisdiction, Legal review, Land tenure, Judicial decisions, Legislation, Legal aspects, Real property.

Plaintiff county brought an action seeking to have a city's approval of a land development project overturned. The county contended that improper procedures had been followed by the city in approving the development and that the corporation in charge of the development had recorded plats of the subdivision without the required approval of the County Commissioners. In addition, the county was seeking a declaratory judgement that it had the right to appeal the city's order to the Florida Land and Water Adjudicatory Commission. After the trial court dismissed the action, the plaintiff appealed. The District Court remanded the case, finding that the county was entitled to a determination pertaining to its right to exercise control over subdivisions by way of certain recording statutes. The court agreed, however, that the city has zoning jurisdiction over the land in question and thus the county had no standing to attack any improper procedures pertaining to the approval of the development. Finally, the court held that the county did not have the right to appeal to the Adjudicatory Commission. The court noted that recent judicial interpretations had strictly construed the statute pertaining to regional development. Thus, since the county was not specifically given the statutory authority to seek review of any development order, it had none. (Hoffman-Florida)
W76-07902

VINCENT V MEAUX (CHANGING THE SHAFT OF A WELL BECAUSE WATER TABLE LOWER NOT CONSTITUTING A NEW WELL BUT PRESERVATION OF SERVITUDE).
325 So2d 346-49 (La. Ct. App. 1975). 4 p.

Descriptors: *Louisianna, *Water rights, *Wells, *Prescriptive rights, *Water table, Steel pipes, Well casings, Groundwater, Water law, Legal aspects, Contracts, Compensation, Water utilization, Land tenure, Judicial decisions, Water demand, Water level fluctuations.
Identifiers: Servitudes.

A 1941 partition agreement provided that one tract would be divided into three lots, with each lot having a water right in a well located on the No. 3 lot. Plaintiff lot owner who was seeking a declaration of his rights under the agreement, was attempting to prevent the defendant, a predecessor-in-interest to one of the original lot owners, from withdrawing water from the well. Evidence introduced at trial showed that the well had dried up in 1951, and that the defendant's predecessor was forced to lower the well and to recase it with steel. After this date, the plaintiff had paid a fee for use of water from the well. The defendant contended that the servitude was extinguished when the well was deepended; furthermore even if the servitude was not then extinguished, it was later extinguished by prescriptive rights since the plaintiff's payment for the water was not a use of the servitude. The court rejected these contentions, however, finding that the lowering and recasing of the well did not constitue the digging of a new well and thus did not extinguish the servitude. The court also found that the prescriptive period had not run since the well had been used by the plaintiff at least once every 10 years. The fact that the plaintiff paid for that use was irrelevant to the question of whether the prescriptive period had run. (Hoffman-Florida)
W76-07903

MORGAN V. CULPEPPER (FLOODING OF LOW LYING AREA CAUSING ENCLOSURE OF PROPERTY TO EXTENT REQUIRED TO IMPOSE SERVITUDE).
324 So 2d 598-606 (La. Ct App 1975). 9p.

Descriptors: *Louisiana, *Flooding, *Land tenure, *Access routes, *Roads, Transportation, Compensation, Leases, Flood frequency, Overflow, Runoff, Right-of-way.
Identifiers: Landlocked property, Servitude.

Because his land had no access to a public road, plaintiff landowner brought an action seeking to obtain a servitude of passage across land owned by defendent adjacent landowners and leased by other defendents. After the trial court dismissed the action, the plaintiff appealed contending that the plaintiff had access to a public road by any one of several roads and thus was not entitled to relief. The Louisiana Court of Appeal rejected this contention, however, since it found that the roads referred to by the defendents were in low-lying areas and were frequently impassable because of periodic flooding. Therefore, since the land was found to be enclosed, a legal servitude would generally be taken where the distance is shortest to the public road. This general rule was found to be inapplicable in this case since the shortest route would often be impassable because of flooding. Consequently, the case was remanded for the trial court to determine the location of a passage of servitude least injurious to the defendents and to determine the proper compensation the plaintiff should pay for the servitude. (Hoffman-Florida)
W76-07904

UNITED STATES V. CALIFORNIA (RECLAMATION ACT REQUIREMENT OF CONFORMITY WITH STATE LAWS).
403 F. Supp. 874-903 (ED Cal. 1975). 30 p.

Descriptors: *California, *Water permits, *Federal Reclamation Law, *Unappropriated water, *Federal-state water rights conflicts, Reclamation, Legal aspects, Prior appropriation, Jurisdiction, Administration, Administrative agencies, Environmental effects, Permits, Water resources, State jurisdiction, Judicial decision, United States.

Plaintiff United States contended that the Reclamation Act authorized it to appropriate, for use in a federal reclamation project, unappropriated water within the State of California without applying to the California State Water Resources Control Board. Defendant State contended that the approval of the Board was required since the Act requires that the United States comply with all terms and conditions for the issuance of state water permits. The defendant also contended that this permit compliance is mandated by the National Environmental Policy Act (NEPA). The District Court held that the United States must make an application to the state Control Board in order to determine the availability of unappropriated waters and to give the defendant notice of the scope of the project. The court also found, however, that the United States was required by the Reclamation Act to comply only with state procedural law and not with the substantive law. Thus a state must issue unconditional permits to the United States if unappropriated waters are available. As to the NEPA convention, the court found that the Act was not intended to establish a policy of state control of the environmental aspects of federal reclamation projects nor to give states the authority to place restrictions or conditions on any water permits issued. Summary judgement was then given for the United States. (Hoffman-Florida)
W76-07905

POTOMAC RIVER ASSOCIATION V LUNDERBERG MARYLAND SEAMANSHIP SCHOOL, INC. (PERMITS UNDER RIVERS AND HARBORS APPROPRIATIONS ACT).
402 F Supp 344-59 (D MD 1975). 16 p.

Descriptors: *Dredging, *Navigable waters, *Commercial fishing, *Damages, *Permits, Streams, Navigation, Channel improvement, Judicial decisions, Legal aspects, Channels, Industrial wastes, *Maryland, Landfills, Costs, Environmental effects.
Identifiers: Tort liability, Navigational capacity.

Plaintiff citizen organizations sought damages against defendant corporation arising out of the corporation's dredging and filling of land along a navigable creek. The plaintiffs alleged that these activities obstructed the navigational capacity of the creek and did substantial harm to the marine environment of the area. The defendant responded that it was not liable since it had acquired a valid permit from the Army Corps of Engineers before any work had begun. The court agreed that the defendant was protected for any actions it took pursuant to the permit, even if that permit had been improperly issued. However, the court held that corporate activities outside the scope of the permit would give rise to a cause of action for damages. Thus, commercial fisherman could bring an action for maritime tort if they could show injury to fish caused by corporate activities not authorized by the permit. The citizen organizations could also maintain suits based on obstruction of the creek's navigational capacity. (Hoffman-Florida)
W76-07906

AMERICAN MEAT INSTITUTE V. EPA 'EFFLUENT LIMITATIONS' ON SLAUGHTERHOUSES UNDER THE FEDERAL WATER POLLUTION CONTROL ACT.
526 F2d 442-67 (7th Cir 1975). 26 p.

Descriptors: *Water quality standards, *Effluents, *Sewage lagoons, *Waste treatment, Sewage treatment, Water quality control, Regulation, Temperature, Ammonia, Thermal pollution, Technology, Classification, Standards, Legislation, Judicial decisions, Feed lots.
Identifiers: Slaughterhouses wastes, Packing houses, Effluent limitations.

Plaintiff meat institute sought a review of Environmental Protection Agency (EPA) regulations which set forth effluent limitations pertaining to certain substances used by slaughterhouses and packinghouses. Plaintiff contended that seasonal and climatic effects would prevent the achievement of the 1977 effluent limitations set down by the EPA pertaining to the three-lagoon system of waste treatment. This contention was rejected by the court, which found that winter and summer

temperatures would not render the limitations unattainable by designated 1977 technology. The court then addressed the plaintiff's contention that the 1977 limitations were arbitrary and capricious. The court found that, with the exception of TSS limitations for complex slaughterhouses, the limitations were based on reliable and well-reasoned evidence. With one exception, the same conclusions were also reached as to 1983 limitations. The one exception was that the 1983 technology pertaining to ammonia limitations was found to be unfeasible, thus invalidating 1983 effluent limitations based on that technology. In sum, all of the EPA regulations were upheld on review except for the 1977 and 1983 TSS limitations for complex slaughterhouses and the 1983 ammonia limitations. (Hoffman-Florida)
W76-07907

NATURAL RESOURCES DEFENSE COUNCIL V. CALLAWAY (FEDERAL WATER POLLUTION CONTROL ACT).
524 F2d 79-97 (2d Cir 1975). 19 p.

Descriptors: *Waste dumps, *Environmental effects, *Dredging, *Federal Water Pollution Control Act, *Federal jurisdiction, Waste disposal, Water pollution sources, Solid wastes, Legislation, Landfills, Standards, Administrative agencies.
Identifiers: Environmental impact statements.

Plaintiff environmental groups brought this action seeking to enjoin the Navy from dumping highly polluted dredged spoil into a Connecticut dumping site. Plaintiffs raised three contentions at the trial court: (1) the dumping permit issued to the Navy by the Army Corps of Engineers was in violation of the Federal Water Pollution Control Act (FWPCA); (2) the Corps and not the Navy should have prepared the environmental impact statement (EIS); and (3) that even if the Navy was the proper author, the EIS contained inadequate information. The trial court rejected these contentions, however, finding that it had no jurisdiction under the FWPCA, and finding that the Navy was the proper author of an adequate EIS. On appeal, the court found that the FWPCA provision requiring that the defendants be given a 60 day waiting period after notice of the violation before private suits could be brought was not a jurisdictional prerequisite to suit under the FWPCA. Thus the court had jurisdiction. Although the court found the Navy to be the proper author of the EIS, it found the statement to be in violation of statutory standards since it did not discuss the cumulative effect the dumping would have on surrounding areas, and did not adequately discuss alternative sites. The case was therefore reversed in part and remanded for further consideration. (Hoffman-Florida)
W76-07908

GRIMBLE V. RAPIDES PARISH POLICE JURY (LACK OF VALID RIGHT OF WAY DEED RESULTING IN INVALID DRAINAGE EASEMENT).
322 So 2d 835-39 (La. Ct App 1975). 5 p.

Descriptors: *Louisiana, *Canals, *Damages, *Eminent domain, *Flooding, *Penalties(Legal), Legal aspects, Adjacent landowners, Real property, Costs, Crops, Flood damage, Constitutional law.

Plaintiff landowner brought this action against defendant police jury for damages resulting from the construction of a canal across his land, and for the value of the property so appropriated. The trial court awarded plaintiff only $300 damages and the plaintiff appealed, contending that the canal, which was dug in 1950 without valid authorization, had caused flooding of his land for over twenty years. Plaintiff was thus seeking $21,000 in damages, alleging that the flooding resulted in a crop loss of $1,000 a year. The court rejected this claim, however, holding that a landowner who had knowledge of the taking is entitled to recover the value of the property computed as of the date of taking. In this case, the value of the land in 1950 was $300 per acre. Since the land taken comprised only .37 of an acre, the plaintiff should only have been awarded $110. However, since the defendant had not appealed the $300 judgement was allowed to stand. (Hoffman-Florida)
W76-07909

COMMONWEALTH V WASHINGTON TOWNSHIP (PA. CLEAN STREAMS LAW).
344 A2d 456-57 (Pa. 1975). 2 p.

Descriptors: *Streams, *Pennsylvania, *Judicial decisions, *Water quality control, *Penalties(Legal), Legal aspects, Water law, State governments, Local governments, Governmental interrelations, Legislation, Water pollution, Water quality, Water pollution control.
Identifiers: Pennsylvania Clean Streams Law.

Petitioner Commonwealth of Pennsylvania sought an order to compel respondant municipality to comply with final orders of the Department of Environmental Resources made pursuant to Pennsylvania's Clean Streams Law. The respondant contended that a section of the Clean Streams Law provided for a sanction for contempt of court if a municipality failed to comply with an order and that, therefore, all other judicial remedies were precluded by the Law. The Supreme Court of Pennsylvania held that the language of the Clean Streams Law did not preclude judicial remedies other than a contempt sanction. Thus, an order requiring compliance with the orders of the Department of Environmental Resources was an appropriate remedy under the statute. (Nursey-Florida)
W76-07910

SCHWEND V. JONES (WATER RIGHTS REPRESENTED BY WATER STOCKS PASS BY CONTRACT FOR DEED).
515 P2d 89-91 (Mont. 1973). 3p.

Descriptors: *Montana, *Riparian rights, *Land tenure, *Relative rights, Legal aspects, Boundaries(Property), Adjacent land owners, Water law, Water rights, Judicial decisions, Legal review, State jurisdiction, Water utilization, Boundary disputes, Water rights, Real property.

The plaintiffs, purchasers under contract for deed to farmland, sought a declaratory judgement determining ownership of water rights between purchaser and seller. The written contract for deed described the land but did not refer to hereditaments, appertenances, or water rights. The water rights were evidenced by shares of stock in a ditch company. The plaintiffs claim for relief was founded on the belief that such water rights were appertenant to the land and, therefore, passed with it. The defendant filed a general denial and claimed res judicita. The trial court entered judgement for the plaintiffs and the Supreme Court of Montana affirmed, holding that the water rights were appertenant to the land sold. Thus the contract for deed effectively conveyed ownership in absence of an express reservation. (Griffith-Florida)
W76-07911

DOUGHERTY V. CALIFORNIA-PACIFIC UTILITIES CO. (DAMAGE ASSESSMENT BECAUSE OF LACK OF DUE CARE IN CANAL WATERFLOW MANAGEMENT).
546 P2d 880-85 (Utah 1976). 6p.

Descriptors: *Utah, *Spillways, *Cloudbursts, *Flood damage, *Ditches, Canals, Diversion structures, Public utilities, Electric powerplants, Negligence, Hazards, Floods, Flood protection, Real property, Legislation, Surface runoff.
Identifiers: Proximate causation.

Plaintiff homeowner brought action against defendant utility company for damages sustained when defendant's canal overflowed and flooded plaintiff's property. The defendant's canal was situated on a hillside with plaintiff's property downhill. The overflow occurred during a severe rainstorm. While the canal was equipped with water flow controls, none was employed to prevent the overflow. The plaintiff alleged negligence in failure to prevent flooding while the defendant argued that the storm water was an 'act of God'. The trial court entered judgement for the plaintiff. The Utah Supreme Court affirmed in a split opinion. Utah statutes impose a duty on water diverters to prevent damage to others' property. The standard of care imposed is reasonable care under the circumstances. Due to the dangers inherent in water control, management should be accomplished with skill and expertise. If the storm was reasonably forseeable or if action could have been taken once the magnitude was recognized, failure to use canal flow devices constituted a breach of duty and was the proximate cause of the flood damage. (Comer-Florida)
W76-07912

BRAVERMAN V. EICHER (MODIFIED CIVIL LAW RULE OF SERVIENT TENEMENT TO NATURAL DRAINAGE).
238 NW2d 331-39 (Iowa 1976). 9p.

Descriptors: *Iowa, *Surface drainage, *Civil law, *Surface runoff, *Natural flow doctrine, Relative rights, Alteration of flow, Artificial flow, Erosion, Landscaping, Buildings, Penalties(Legal), Land fills, Adjacent landowner, Reasonable use.
Identifiers: Nuisance(Legal aspects), Evidence, Injunctive relief.

Plaintiff servient estate owner brought action against defendant dominant estate owner for damages and injunctive relief pertaining to an alleged drainage nuisance. The defendant counterclaimed asking for a mandatory injunction requiring that a restraining wall be constructed. The trial court awarded plaintiff damages, denied injunctive relief to either party and required both parties to share the cost of constructing a retaining wall. The Iowa Supreme Court affirmed. Iowa applies the modified civil law rule under which a servitude of natural drainage exists between adjoining lands which servient estate owner must accept. The dominant estate owner may incur liability, however, for altering the natural system of drainage and thereby substantially increasing the servient estate burden. Liability may also be incurred for removal of lateral support from adjoining land and for improper land filling which allows earth to pass or slide onto adjoining land. In this case, the Court found that sufficient evidence had been introduced to support an attendant monetary award for damages caused to plaintiff's land. The court refused to award exemplary damages for drainage nuisance, however, since no actual or legal malice had been shown. (Comer-Florida)
W76-07913

STEFFEN V. COUNTY OF CUMING (FLOODING DAMAGES TO CROPS).
238 NW2d 890-94 (Neb. 1976). 5p. 1 map.

Descriptors: *Nebraska, *Water injury, *Crop response, *Damages, *Ditches, Irrigation ditches, Diversion structures, Flooding, Surface drainage, Flood protection, Remedies, Obstruction to flow, Crops, Local governments, Value.
Identifiers: Injunctive relief, Proximate causation.

Plaintiff landowner brought action requesting an injunction and damages against defendant township. The plaintiff's pasture was bordered by a man made ditch which carried runoff water from a nearby creek. The ditch runs into another ditch maintained by defendant township. The second ditch flows into another nearby creek. After the township cleaned and widened the second ditch,

the plaintiff alleged that the cleaning caused runoff water to flood his pastureland. The trial court denied relief and the Nebraska Supreme Court affirmed holding that the measure of damages is the difference between the value of the land before the damage and the value of the land after damage. Since plaintiff failed to introduce evidence establishing these values, the Court had no bases on which to award compensible damages. The Court also found injunctive relief to be unavailable since no evidence was introduced establishing that the widening changed the water diversion in amount or source. (Comer-Florida)
W76-07914

MOBIL OIL CORP. V. TOWN OF HUNTINGTON (CONSTITUTIONALITY OF OIL SPILLAGE ORDINANCE).
380 NY52d 466-76 (Sup. Ct. 1975) 11p.

Descriptors: *New York, *Oil spills, *Legislation, *Permits, *Navigable waters, Ships, Transportation, Docks, Oil industry, Natural gas, Oil pollution, Oil wastes, Storage tanks, State governments costs.

Plaintift oil distribution terminal sought a declaration of invalidity of defendant municipality's oil spillage ordinace. The ordinance requires a permit grant for transfer of more than 600 gallons of liquid fuel or oil with permit issuance predicated upon specific satety equipment installation. A fee imposed on fuel transferred by terminal operators finances a spill prevention and clean up fund. On motions for dismissal by the defendants the court found the ordinance consistent with federal law, interstate commerce and admiralty jurisdiction. The court also found the law within the statutory enactment power of the town. While rejecting the plaintiff's allegations of vagueness and indefiniteness, the court remanded the case for a redetermination of fact issues. (Comer-Florida)
W76-07915

STATE V. BUNDRANT (STATE REGULATION OF SEDIMENTARY MARINE LIFE ON OUTER CONTINENTAL SHELF NOT PRE-EMPTED BY SUBMERGED LANDS ACT OR OUTER CONTINENTAL SHELF LANDS ACT).
546 P2d 530-64 (Alas. 1976). 35p.

Descriptors: *Alaska, *Crabs, *Continental shelf, *Federal jurisdiction, *State jurisdiction, Marine fisheries, Jurisdiction, Treaties, Submerged Lands Act, Regulation, Law enforcement, State governments, Constitutional law, Legislation, Marine animals.
Identifiers: Territorial seas(Jurisdiction), Outer Continental Shelf Lands Act.

Plaintiff state charged defendant fishermen with criminal violation of various state statutes and regulations relating to crabbing in the Bering Sea. Since the alleged violations took place outside of the three mile territorial sea limit, the fishermen contended that the plaintiff had no jurisdiction over their actions. Furthermore, they contended that when Congress enacted the Submerged Lands Act, it conferred exclusive federal jurisdiction over fishery regulation beyond the three mile limit. The Alaska Supreme Court held for the plaintiff and made the following findings: (1) fishery regulation in the Bering Sea beyond the three mile limit was not under exclusive federal jurisdiction; (2) neither of the two Acts had preempted state regulation of sedementary marine life on the outer Continental shelf; and (3) the state had the power to bring criminal action against the defendants. (Lasris-Florida)
W76-07916

JIVELEKAS V. CITY OF WORLAND (WHAT CONSTITUTES DAMAGES BY BLOCKED SEWER LINE).
546 P2d 419-34 (Wyo. 1976). 26p.

Descriptors: *Wyoming, *Sewers, *Overflow, *Damages, *Negligence, Cities, Pipelines, Accidents, Legal aspects, Risks, Pipes, Design standards, Public utilities, Treatment facilities, Governments, Planning, Backwater, Judicial decisions.
Identifiers: *Sovereign immunity.

Plaintiff homeowners sought damages from defendant city for damage caused to their homes by a sewer back-up which allegedly occurred as a result of defendant's negligent planning, construction and maintenance of a sewer line. The defendant contended that it was not negligent, and that even if it was, such negligence was not a proximate cause of the purported damage. The plaintiffs' sole proof was that a better sewer line could have been installed and that the sewer line in question had become plugged with resulting damage to their property. The Wyoming Supreme Court noted that uncontradicted expert testimony on defendant's behalf demonstrated that the sewer line was adequate and that the plugging of sewer lines might occur even though due care is exercised in their construction, design and maintenance. Since the plaintiffs had failed to connect any alleged negligence of the defendant with the damages claimed, the judgement for the defendant was affirmed. (Lasris-Florida)
W76-07917

BRIGGS V. GOLDEN VALLEY LAND AND CATTLE CO. (THE FIXING OF ANNUAL WATER RIGHTS ASSOCIATED WITH VARIOUS GROUNDWATER LICENSES).
546 P2d 382-91 (Idaho 1976). 10p, 1 tab.

Descriptors: *Idaho, *Bank storage, *Aquifer management, *Aquifers, *Groundwater mining, Groundwater, Water storage, Storage, Groundwater recharge, Natural recharge, Groundwater resources preferences(Water rights), Jurisdiction, Judicial decisions, Permits, Legal aspects, Available water-recharge, Constitutional law.
Identifiers: Water rights(Non-riparian), Administrative regulations.

Plaintiff groundwater users appealed an order of defendant, director of Department of Water Administration, fixing annual water rights associated with groundwater licenses. The director's order modified a previous court order which set a maximum yearly amount of water that could be pumped from the aquifer. The plan allowed water users to 'bank' the difference between the amount used in one year and the maximum amount allowed per year. The 'banked' water could then be withdrawn in a later year if necessary. The trial court held that the director had no authority to modify the prior court order. On appeal to the Supreme Court of Idaho, the defendants argued that the plaintiff's appeal to the district court had not been perfected under the Administrative Procedure Act. The Supreme Court agreed but was unable to determine whether the appeal was properly commenced under an alternative method and remanded to the district court for such a determination. In so doing, the court pointed out that the 'banking' plan was within defendant director's power to implement so long as he found that 'mining' of the aquifer would not result. (Lasris-Florida)
W76-07918

STATE DEPARTMENT OF ENVIRONMENTAL RESOURCES V METZGER (JUSTIFICATION OF SEWER REGULATIONS: MERE POSSIBILITY OF WATER POLLUTION).
347 A2d 743-46 (Pa. Com. Ct. 1975). 4 p.

Descriptors: *Pennsylvania, *Sewage disposal, *Groundwater, *Regulation, Environmental control, Sewage, Water pollution, Legal aspects, Governments, Standards, Judicial decisions, Treatment facilities, Water pollution control, State governments.
Identifiers: *Tidal wetlands.

Plaintiff applicant sought a permit to install a sewage disposal system. Defendant state agency refused to grant the permit because the plaintiff had not proved compliance with regulations existing at the time of adjudication. The plaintiff contended that those regulations were not in effect when he filed for the permit and, therefore, he should not be required to adhere to them. Alternatively, the plaintiff argued that any regulations prohibiting his system, which he alleged would cause no pollution, were unreasonable and would constitute an unlawful exercise of police power. The Commonwealth Court of Pennsylvania held that the plaintiff was required to comply only with the regulations in effect at the filing of his application. Nevertheless, the court affirmed the decision since the plaintiff had failed to comply with those existing regulations. As to the alternative argument, the court held that a mere possibility that pollution could result from the installation of a proposed sewage system was enough to justify the regulation. (Lasris-Florida)
W76-07919

TORTOLANO V DIFILIPPO (INJUNCTION TO STOP WATER FLOW ACROSS PROPERTY).
349 A2d 48-53 (RI 1975). 6 p, 1 map.

Descriptors: *Rhode Island, *Adjacent land owners, *Retaining walls, *Alteration of flow, *Diversion, Legal aspects, Compaction, Land forming, Erosion, Erosion control, Slopes, Natural flow doctrine, Surface waters, Surface runoff, Landslides, Mudflows, Debris avalanches, Damages, Judicial decisions.
Identifiers: Common enemy rule, Injunctive relief.

Plaintiff landowners sought to enjoin defendant owner of adjoining land from allowing debris from the defendant's property to be carried by storm water onto the plaintiffs' property. The plaintiffs further sought to require the defendant to install and maintain a retaining wall for lateral support and to pay damages to restore the plaintiffs' premises to their original condition. The plaintiffs owned a lot downhill from and abutted on two sides by the defendant's property. The defendant deposited large amounts of loose fill on his property significantly increasing its natural steep grade. The plaintiffs contended that the surface waters diverted to their land by the change in grade carried large quantities of loose fill onto their property causing damage. The defendant argued that the common enemy doctrine regarding surface waters should control. The trial court granted the injunctions and damages sought by the plaintiffs holding that where the defendant had created the situation by elevating his property above the natural grade, he had an affirmative duty to prevent the fill from sliding onto the plaintiffs' adjoining lot. The Supreme Court of Rhode Island affirmed, noting that the common enemy doctrine did not apply in this case. (Capehart-Florida)
W76-07920

LEHAN V STATE DEPARTMENT OF TRANSPORTATION (SEWAGE POLLUTION OF LANDOWNER'S WELL NOT A TAKING UNDER EMINENT DOMAIN CODE),
349 A2d 492-93 (Pa. Com. Ct. 1975). 2 p.

Descriptors: *Pennsylvania, *Eminent domain, *Sewage, *Ditches, *Water pollution, Drainage, Drains, Highways, State governments, Administrative agencies, Runoff waters, Adjacent property owners, Trespass, Legal aspect, Judicial decisions, Water pollution sources, Sewage effluents, Damages, Wells.
Identifiers: De factotaking, Injunctive relief.

Plaintiff landowners brought action for compensation from defendant state agency under the eminent domain code. The defendant maintained an earthen ditch along the plaintiffs' property to carry runoff water from a highway. The plaintiffs' neighbors discharged sewage and other waste

materials into the defendant's drain which emptied into the ditch. As a result, the plaintiffs' well and property were polluted. The plaintiffs were denied injunctive relief against the neighbors. The plaintiffs contended that the defendant had effected a de facto taking of their property by permitting introduction of sewage into the drainage system, thereby producing damage to the property. The trial court held that the plaintiffs had stated a proper cause of action. The Commonwealth Court of Pennsylvania reversed, dismissing the action. That court held that the injury was not the direct and unavoidable consequence of the defendant's conduct and therefore did not constitute a defacto taking. The court said that redress for injuries resulting from improper conduct by third parties would have to be sought in a trespass action against those parties. (Capehart-Florida)
W76-07921

BD OF ED V STATE DEPT OF TRANSP (RAILROAD LIABILITY FOR FLOODING CAUSED BY PIPELINE'S INABILITY TO HANDLE INCREASED WATER VOLUME),
351 A2d 17-22 (NJ 1976). 6 p.

Descriptors: *Drainage effects, *New Jersey, *Railroads, *Obstruction to flow, *Floods, Drains, Pipes, Streams, Upstream embankments, Watersheds(Basins), Bulkheads, Structures, Natural flow, Dams, Relative rights, Reasonable use, Culverts, Surface drainage, Legal aspects, Judicial decisions, Administrative agencies, State governments.
Identifiers: Injunctive relief, Common enemy rule.

Plaintiff board of education sought to enjoin defendant department of transportation and defendant railroad to abate a nuisance. Prior to 1920, the defendant had installed a 24-inch drainage pipe to allow a stream draining a 735-acre watershed to pass under a railroad embankment. Development in the area had rendered the pipe inadequate resulting in the periodic flooding of two schools maintained by the plaintiff. The plaintiff contended that flooding would be reduced by removal of a bulkhead installed by the defendant. The plaintiff further contended that significant alleviation of the general flooding problem would only be accomplished by improvement of the railroad culvert. The defendant railroad contended that the upstream owner had no cause of action for interference with a stream by a downstream owner. The trial court required the railroad to construct new drainage facility. In affirming, the Supreme Court of New Jersey held that obstructors of water courses have a continuing duty to accommodate their structures to the passage of such increasing volume of waters as is attendant upon area development so as not to visit flood damage upon others. (Capehart-Florida)
W76-07922

STATE DEPT. OF ENVIRONMENTAL PROTECTION V. JERSEY CENTRAL PWR AND LIGHT CO. (NO LIABILITY FOR DISCHARGE OF UNHEATED WATER INTO STREAM BECAUSE SUCH WATER NOT PROXIMATE CAUSE OF DEATH OF FISH),
351 A2d 337-45 (NJ 1975). 9 p, 2 tab.

Descriptors: *New Jersey, *Nuclear powerplants, *Fishkill, *Water cooling, *Thermal pollution, Electric power industry, Fish, Discharge(Water), Rivers, Streams, Heated water, Temperature, Water temperature, Water pollution sources, Regulation, Federal Government, State governments, Administrative agencis, Legal aspects, Federal jurisdiction.
Identifiers: *Menhaden, Proximate causation, Strict liability.

Plaintiff state department of environmental protection sought penalties and damages from defendant-public utility for fish kills allegedly caused by the operation of its nuclear power plant located between two rivers. Water from one river was run through the plant for cooling and then discharged in a heated state into the other river. In January, 1972, the plant was temporarily shut down and the second stream was no longer heated. Subsequently, menhaden fish living in the heated stream died when water temperatures fell below 39 degrees. Plaintiff contended that the defendant violated a New Jersey statute prohibiting the introduction of destructive substances into fresh waters when it pumped cold water into the warm stream. The trial court held the defendant liable for damages under strict liability for an ultra-hazardous situation. The appellate court found liability for negligence. The Supreme Court of New Jersey reversed, holding that the plaintiff had failed to establish a violation of the statute and that the pumping was not the cause in fact of the fish kill. The court further held that the defendant was subject to federal, rather than state, regulations. (Capehart-Florida)
W76-07923

SMITH COVE ASS'N V. SPECIAL BD (PROCEDURE FOR REMOVAL OF WHARVES AND PIERS),
352 A2d 726-28 (NH 1976). 3 p.

Descriptors: *New Hampshire, *Piers, *Jurisdiction, *Administrative agencies, Beds, Docks, Land tenure, Ownership of beds, Judicial decisions, Legal review, Legal aspects, Structures, Lakes, Lake beds, High water mark, Permit, Regulation, Administrative decisions, Channels.
Identifiers: Writ of mandamus, Administrative regulations.

Plaintiff association sought a writ of mandamus compelling defendant board to request that the attorney general petition in court to order the removal of piers on co-defendant landowner property. The plaintiff contended that the landowner was required to obtain a grant from the governor and council since the piers were located below the mean high water level of a lake. The defendant landowner contended that the permit from the board was sufficient for his proposed changes in that part of the channel lying within the boundaries of his property. The trial court approved the master's recommendation for dismissal of the plaintiff's action. The Supreme Court of New Hampshire reversed and remanded a case for full fact finding on the issues. The court said it had not been established whether defendant landowner was properly authorized by the board, or whether a grant by the governor and council was required. The court stated that the board's jurisdiction depended on a determination of whether the piers were in public waters or in the bed of public waters before the landowner's shoreline. The court held that until the prescribed procedure for review was followed, no occasion for interpretation of the statute was presented. (Capehart-Florida)
W76-07924

MILLS V. MURPHY (ALTERATION OF FRESH WATER WETLANDS UNDER THE FRESH WATER WETLANDS ACT),
352 A2d 661-74 (RI 1976). 14 p.

Descriptors: *Alteration of flow, *Rhode Island, *Freshwater marshes, *State jurisdiction, *Water resources development, Land reclamation, Riparian rights, Legislation, Administrative agencies, Navigable water, Constitutional law, Public rights, Rivers.
Identifiers: *Public trust doctrine, Licenses, Presumptions(Legal).

Plaintiff landowners brought an action to have the Rhode Island Fresh Water Wetlands Act declared unconstitutional on its face and to enjoin enforcement. The plaintiffs had attemptd to relocate certain areas of a river passing through their lands. Under the Act, defendant director of Natural Resources could respond to violations of the Act and, in conjunction with local municipalities refuse freshwater wetland alteration. The trial court granted the defendant's summary judgement motion. The Rhode Island Supreme Court affirmed, relying on the statute amended during appeal pendancy. The court found the statements of policy contained within the Act and the Act's limitation to particular geographic areas represented adequate limitations on discretion. Furthermore, equal protection is not abridged unless plaintiff can show that saltwater wetlands owners and freshwater wetlands owners are similarly situated. (Comer-Florida)
W76-07925

STEPHENS V. BURTON (LIMITATIONS OF WATER APPURTENANT TO CONVEYED PROPERTY).
546 P2d 240-42 (Utah 1976). 3 p.

Descriptors: *Cattle, *Utah, *Spring waters, *Withdrawal, *Consumptive use, Water supply, Water users, Water yield, Boundaries(Property), Reasonable use, Relative rights, Legal aspects, Water rights, Irrigation water, Judicial decisions.

Plaintiff grantees brought an action to determine water rights in the flow of certain springs. The defendants owned certain property and the right to use the flow of water equally. One of the defendants had conveyed approximately one quarter of the acreage owned through two deeds. One of the deeds contained no mention of conveyance or reservation of water rights, while the other deed provided for the conveyance of stock water rights. A Utah statute provides that water rights appurtenant to lands shall pass to the grantee of such land except that reservation may be made in express terms so that water rights may be separately conveyed. If a water right has been exercised in irrigating different parcels at different times, only that amount of water which was used immediately preceding the time of conveyance is deemed appurtenant to the land conveyed. Since the trial court had determined the number of gallons per minute conveyed for watering cattle, the Supreme Court remanded, holding that water rights must be determined in relation to use prior to sale when water is used for irrigation or for stock watering purposes. (Comer-Florida)
W76-07926

MATTER OF APPLICATION FOR WATER RIGHTS OF PREISSER (AVAILABILITY OF WATER TO SUPPLY DEMANDS OF JUDICIAL DECREE).
545 P2d 711-12 (Colo 1976). 2 p.

Descriptors: *Rivers, *Colorado, *Water wells, *Groundwater basins, *Groundwater availability, Water sources, Groundwater movement, Water supply, Subsurface waters, Legal aspects, Judicial decisions, Priorities, Legal review.
Identifiers: Water rights(Non-riparians).

Appellee water supply contractors made application for a conditional decree awarding water wells. Appellant objectors alleged that the water was not available to supply the decree. The wells in question were located in the drainages of two creeks which were fed by water from a basin. The trial court determined that the water in the basin could not be administered as part of the Arkansas River because the water would not reach the river for a period of three hundred to eight hundred years. The trial court's decree, which allowed 14 wells to withdraw water not to exceed 8100 acre feet per year for irrigation, municipal, commercial, industrial, recreational, and other beneficial purposes, was affirmed by the Supreme Court of Colorado. That court held that the parties had conceded that if water were available to supply the decrees no other problem existed. There was sufficient evidence of availability on the record. (Comer-Florida)
W76-07927

UNITED STATES V ONE (1) 43 FOOT SAILING VESSEL WINDS WILL, LICENSE O. N. 531317/US AND EQUIPMENT (NO EXERCISE OF SOVREIGNTY ON WATERS OF HIGH SEAS).
405 F. Supp. 879-84 (SD Fla. 1975). 6 p.

Descriptors: *Federal jurisdiction, *Coast Guard regulations, *Law of the Sea, *International law, Constitutional law, Boating regulation, Navigation, Oceans.
Identifiers: Territorial seas(Jurisdiction), Laches.

Plaintiff United States sought forfeiture of a sailboat which the Coast Guard had boarded for a safety check and found to contain marijuana. Coast Guard found ship on the high seas, running without lights at night. They boarded the ship for a routine safety inspection, and noticed strong smell of marijuana. The officiers searched the ship and found 2030 pounds. Defendant owner contends plaintiff should be barred by laches, that plaintiff had no jurisdiction over a vessle on the high seas, and that there was insufficient probable cause to uphold the search. The court found that no nation may exercise sovereignty over the waters of the high seas, and that only vessles of the United States Government may exercise jurisdiction over United States flag vessels. Here, the defendant was the party responsible for the decay in the proceedings, and forfeiture occurs at the moment of illegal use. The vessel here was of the United States and therefore subject to its jurisdiction. The boarding was for a safety inspection, therefore no probable cause needed. The marijuana was in plain view. (Edenfield-Florida)
W76-07928

THOMAS V. CLARK (GRANTING OF RIGHT TO TAKE WATER FROM LAND AS CONVEYING RIGHT IN THE LAND ITSELF).
346 A2d 189-91 (Vt. 1975). 3 p.

Descriptors: *Vermont, *Water rights, *Real property, *Spring waters, *Developed waters, Springs, Confined water, Water utilization, Consumptive use, Judicial decisions, Legal aspects, Reasonable use, Competing uses, Appropriation, Diversion, Water demand, Land tenure.

Plaintiff servient estate owners brought action against defendant dominant estate owner to determine spring rights. The spring rights originated in a warranty deed from a common grantor in both plaintiffs' and defendant's chain of title. No developed spring existed at the time but the spring in dispute was subsequently developed. After development the defendant asserted a use right. The trial court found for defendant and the Vermont Supreme Court affirmed, holding that the grant of right to take water from land conveys a right in land itself. When no developed spring existed at the time of grant of spring rights the dominant estate owner may use a subsequently developed spring as long as such use does not deprive servient estate owners of land use. Where it is determined that the dominant estate owner is entitled to use a spring developed solely by servient estate owner, the doctrine of unjust enrichment will not affect the use right even though contribution may be required. (Comer-Florida)
W76-07929

SPINDOR V LO-VACA GATHERING COMPANY (FORESEEABLE FILL-IN OF LAKE RELEVANT IN DETERMINING REMAINDER DAMAGES IN EMINENT DOMAIN).
529 SW2d 63-67 (Tex. 1975). 5 p.

Descriptors: *Texas, *Eminent domain, *Surface waters, *Condemnation, *Lakes, Legal aspects, Right-of-way, Water pollution, Cost repayment, Value, Economics, Compensation, Economic impact, Lake basins, Lake sediments, Water pollution sources.

Petitioner land buyers were awarded compensation action brought against the respondent condemnor. The petitioners contended that during construction of a pipeline across their lake property the respondent also built a road which subsequent heavy rains washed out. This washout allegedly caused dirt to be spread throughout the lake bottom. The respondent objected to the trial court's damage award, however, contending that the expert testimony given as to the cost to restore the lake after the wash out was inadmissible. The Supreme Court of Texas held that the damage to the lake was preseeable and should be taken into account when determining damages for diminution in value of the petitioners' remainder (lake). Since the damages were foreseeable, evidence of the damages was relevant to the condemnation proceeding. Thus, the evidence of estimated costs to restore the lake was for the jury's consideration in fixing the amount of foreseeable damages in the condemnation proceeding.
W76-07930

WITTER V. COUNTY OF ST. CHARLES (MAN-MADE AVULSION CAUSING NO CHANGE IN COUNTY BOUNDARY LINE).
528 SW2d 160-62 (Mo. Ct. App. 1975). 3 p.

Descriptors: *River flow, *Boundary disputes, *Islands, *Accretion(Legal aspects), *Missouri River, Regulated flow, Chanels, Stream flow, Dams, Dam construction, Dikes, River regulation, Regulation, Legal aspects, Boundaries(Property), Water law, Avulsion, Judicial decisions, Channel flow, Missouri.
Identifiers: Navigation obstructions.

Plaintiff island owner brought a declaratory judgement action against defendant county to determine in which of two bordering counties the island was located. The island had been defined as being in St. Charles county until the main river channel had been altered by construction of a dike built adjacent to the downstream end of the island. The main channel was sealed off and shifted to the north side of the island. The previous boundary between the counties had been defined as 'the middle of the main channel' so that now both counties had assessed taxes against the plaintiff. The Missouri Court of Appeals held that changes caused by accretion could move the boundary line with the shifting but that changes caused by avulsion could not move a boundary line. Since the legal effect of a change by governmental construction is as if the change were caused by an avulsion, the boundary line of the island was found to be the same as it was prior to construction. (Welch-Florida)
W76-07931

CITY OF HAWKINSVILLE V CLARK (RIGHT OF PROPERTY OWNER TO DIG A WELL).
219 SE2d 577-79 (Ga Ct App 1975). 3 p.

Descriptors: *Real property, *Georgia, *Well permits, *Wells, *Constitutional law, Legal aspects, Permits, Regulation, Drilling, Water permits, Subsurface waters, Water law, Public rights, Governments, Judicial decisions, Legal review, Shafts(Excavations), Excavation, Construction, Well regulations.

Defendant land owner was convicted of violating an ordinance which prohibited the digging of a well of any kind without obtaining permission of the Board of Commissioners. The Superior Court held the ordinance unconstitutional and plaintiff city appealed. The plaintiff contended that the ordinance was a valid exercise of its police power to protect the health and welfare of its citizens. The Court of Appeals of Georgia held that while the plaintiff may make reasonable rules and regulations to protect the health and safety of its citizens, the grant or refusal of a permit to dig upon one's own property cannot be left to the arbitrary discretion of the board. Since the ordinance prescribed no rules by which it was to be executed impartially and since it did not give an applicant for a permit an opportunity to be heard concerning his application, the ordinance was found to be unconstitutional. The Court noted that when property rights are involved, due process requires a hearing as a matter of right. (Welch-Florida)
W76-07932

MCCAULEY V PHILLIPS (NO LIABILITY FOR FLOODING OF LOWER LAND RESULTING FROM NON-NEGLIGENT UPPER LAND IMPROVEMENTS).
219 SE2d 854-59 (Va 1975). 6 p.

Descriptors: *Negligence, *Virginia, *Surface runoff, Rainfall-runoff relationships, *Land development, Discharge(Water), Excess water(Soils), Flood discharge, Flow, Overland flow, Rainfall, Running waters, Runoff forecasting, Slopes, Surface waters, Precipitation intensity, Drainage systems, Drainage effects, Drainage water, Damages, Legal aspects, Judicial decisions, Impact(Rainfall).
Identifiers: Injunctions(Prohibitory), Injunctive relief.

Plaintiff lower landowners brought this action to enjoin defendant upper landowners from channeling surface water through a discharge pipe onto lower lands and to recover damages arising from the flooding of the lower lands. The Circuit Court denied relief and the plaintiffs appealed, contending that such denial was an abuse of the judge's discreation. The defendants contended that no abuse of discreation had occurred since the improvements made upon their upper lands were not made negligently and since the surface water runoff naturally flowed upon the plaintiff's lands. The Supreme Court of Virginia held that no greater damage occurred to the plaintiffs' lands than would have naturally; therefore, no liability would be imposed solely because there was an artificial drainage system present. The court also found that the denial of an injunction was not an abuse of the judge's discretion where such an injunction would have rendered the defendants' main building unusable while not affording relief to the plaintiffs. Since improvements made by the defendants were not negligent and the water discharge was not malicious, the defendants were not liable for damages resulting from such improvements. (Welch-Florida)
W76-07933

OPTIONS FOR COST SHARING: COST SHARING ISSUES--DIMENSIONS, CURRENT SITUATION AND OPTIONS.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6C.
W76-08035

6F. Nonstructural Alternatives

TYPE 16 FLOOD INSURANCE STUDY: TSUNAMI PREDICTIONS FOR MONTEREY AND SAN FRANCISCO BAYS AND PUGET SOUND,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
A. W. Garcia, and J. R. Houston.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-A018 421, $9.00 in paper copy, $2.25 in microfiche. Technical Report H-75-17, November 1975. 263 p, 240 fig, 2 tab, 13 ref, append.

Descriptors: *Forecasting, *Flood forecasting, *Tsunamis, California, Washington, Bays, Flood plain insurance, Insurance.
Identifiers: *Flood insurance, *Monterey Bay(Cal), *Puget Sound(Wash), *San Francisco Bay(Cal).

Calculations of runup due to seismic sea waves (tsunamis) of distant origin were made for Monterey and San Francisco Bays and the greater part of Puget Sound. Those areas which are specifically included and excluded are listed. The values presented are interpreted as being equaled or exceeded on the average of once per 100 (R100) or once per 500 (R500) yr, whichever is indicated. All runup values, R100 and R500, are referenced to the mean sea level datum. The combined effects of astronomical tides and tsunamis are incorporated into the analysis as are certain local effects. The effects of wind waves superimposed on the tsunami have been neglected. The simultaneous occurrence of a storm surge and tsunami is considered highly improbable and therefore unlikely to constitute a 1 in 100- or 1 in 500- yr event. Analysis of the error attributed to each of the various steps in the procedure results in an estimated maximum average error of about plus or minus 40 percent. (WES)
W76-07456

ANALYSIS OF STRUCTURAL AND NONSTRUCTURAL FLOOD CONTROL MEASURES USING COMPUTER PROGRAM HEC-5C,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W76-07564

FLOOD PLAIN INFORMATION: CLINTON RIVER AND PAINT CREEK, OAKLAND COUNTY, MICHIGAN.
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W76-07720

FLOOD PLAIN INFORMATION: NORTH YUBA AND DOWNIE RIVERS, DOWNIEVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-07721

FLOOD PLAIN INFORMATION: ROCK RIVER-POPLAR CREEK, LUVERNE AND VICINITY, MINNESOTA.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-07722

FLOOD PLAIN INFORMATION: KETTLE CREEK, WAYCROSS AND WARE COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-07723

FLOOD PLAIN INFORMATION: HURRICANE CREEK, ALMA AND BACON COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-07724

FLOOD PLAIN INFORMATION: LITTLE CRAB ORCHARD CREEK AND PILES FORK CREEK, CARBONDALE, ILLINOIS.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-07725

FLOOD INSURANCE STUDY: PLEASANTON, ALAMEDA COUNTY, CALIFORNIA, (PRELIMINARY REPORT),
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-07726

FLOOD PLAIN INFORMATION: MINNESOTA RIVER AND TRIBUTARIES, MANKATO, NORTH MANKATO, LE HILLIER.
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 4A.
W76-07727

FLOOD PLAIN INFORMATION: GRAND RIVER, GRAND RAPIDS, MICHIGAN AND VICINITY.
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W76-07728

FLOOD PLAIN INFORMATION: MISSISSIPPI RIVER-SAUK RIVER-WATAB RIVER, VICINITY OF ST. CLOUD, MINNESOTA.
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 4A.
W76-07729

FLOOD PLAIN INFORMATION: YALOBUSHA RIVER AND TRIBUTARIES, GRENADA, MISSISSIPPI.
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W76-07730

FLOOD PLAIN INFORMATION: CEDAR CREEK, ATHENS AND CLARKE COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-07731

FLOOD PLAIN INFORMATION: FRESNO RIVER AND COTTONWOOD, LITTLE DRY, AND ROOT CREEKS, MADERA, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-07732

FLOOD PLAIN INFORMATION: MILL SLOUGH, OSCEOLA AND ORANGE COUNTIES, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-07733

FLOOD PLAIN INFORMATION: BIG THOMPSON RIVER, LOVELAND, COLORADO.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-07734

FLOOD PLAIN INFORMATION: NORTH FORK REPUBLICAN RIVER, WRAY, COLORADO.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W76-07739

NATIONAL FLOOD INSURANCE ACT--1975.
For primary bibliographic entry see Field 6E.
W76-07868

STORM DRAINAGE AND URBAN REGION FLOOD CONTROL PLANNING,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W76-08086

PROBLEMS OF REESTABLISHING COMMERCIAL RECREATION BUSINESSES IN NEW YORK FOLLOWING HURRICANE AGNES,
New York State Coll. of Agriculture and Life Sciences, Ithaca.
T. L. Brown.
Water Resources Bulletin, Vol. 11, No. 6, p 1261-1270, December 1975. 1 fig, 3 tab, 9 ref.

Descriptors: *Flood damage, *Marinas, *Recreation, Evaluation, Management, *New York, Economics.
Identifiers: *Flood recovery, *Hurricane Agnes, Campgrounds, Economic losses, Inventories, Commercial recreation firms.

Forty-two commercial campgrounds and thirty-four commercial marinas were studied to determine the amount and types of flood-related damages incurred from Hurricane Agnes, and to evaluate the institutional measures available to help management overcome these losses. Economic losses incurred by firms due to inability to operate, and declines in the number of recreationists, were over twice the magnitude of losses suffered via direct physical damages from flooding. The Federal Flood Insurance Program, as presently constituted, is of very little use to firms having structural investments in and over water. Most firms were complimentary of the Small Business Administration's loan programs. It appears that active programs of communication and promotion are needed following restoration of regions involved in natural disasters to reestablish the tourist industry of those regions. (Bell-Cornell)
W76-08089

6G. Ecologic Impact Of Water Development

LABORATORY AND FIELD TEMPERATURE PREFERENCE AND AVOIDANCE DATA OF FISH RELATED TO THE ESTABLISHMENT OF STANDARDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-07494

INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF PARATHION.
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5G.
W76-07612

LAND DRAINAGE AS A FACTOR IN 'RED TIDE' DEVELOPMENT,
Department of the Environment, Ottawa (Ontario). Shellfish Water Quality Div.
For primary bibliographic entry see Field 5C.
W76-07616

PROCEEDINGS: LAKE TAHOE RESEARCH SEMINAR II, 27 SEPTEMBER 1974, SANDS VAGABOND CONVENTION CENTER, SOUTH LAKE TAHOE, CALIFORNIA,
Lake Tahoe Area Research Coordination Board South Lake Tahoe, Calif.
For primary bibliographic entry see Field 5G.
W76-07793

PROPOSED KAIPAROWITS PROJECT, FINAL ENVIRONMENTAL IMPACT STATEMENT.
March 3, 1976. 3497 p, 289 fig, 321 illus, 770 ref. Final EIS, FES 76-12. (Six volume report).

Descriptors: *Colorado River, *Environmental effects, *Utah, *Electric power plants, *Air pollution, Electric power production, Colorado River Compact, Coal mines, Water pollution sources, Mercury, Natural resources, Public lands, National parks, National recreation areas, National forests, National monuments, Aquifers, Water distribution(Applied), Land subsidence, Lakes, Tributaries, Drainage patterns(Geologic), Transmission lines.
Identifiers: *Environmental impact statement, Mercury pollution, *Kaiparowits project.

The Kaiparowits project located on Kaiparowits Plateau in southern Utah is planned as a 3,000 megawatt, coal-fired, electricity-generating station to provide power for areas of Arizona and southern California. Within a 100-mile radius of the project are National Parks, Forests, Recreation Areas and Monuments. The major environmental impact of the project would be degradation of the air quality of the surrounding area. Mercury from stack emissions deposited in local drainage basins tributary to Lake Powell would increase mercury bio-amplification in the ecosystem of the lake. Subsidence due to mining of coal for the project is expected to cause disruption of aquifers. The 50,000 acre-feet of Colorado River water used each year by the project would reduce Utah's remaining allotment by 10% and would also compound existing salinity problems in the river. The accumulated fly ash scrubber sludge residue would be a long-term pollution source for Lake Powell. Possible alternatives include transporting Kaiparowits coal to another site or using nuclear power. The 420 million tons of coal burned would replace 33 million barrels of crude oil. The present wild character of the area would be irreversibly altered. (Capehart-Florida)
W76-07800

ENVIRONMENTAL LAW: WHAT IS 'MAJOR' IN 'MAJOR FEDERAL ACTION', MINNESOTA PUBLIC INTEREST RESEARCH GROUP V. BUTZ, 498 F2D 1314 (8TH CIR. 1974).
For primary bibliographic entry see Field 6E.
W76-07809

ENVIRONMENTAL ASPECTS OF DEEP SEA MINING,
Center for Law and Social Policy, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-07815

LEGAL CONSIDERATIONS FOR THE CONSTRUCTION AND OPERATION OF A DEEP-WATER OIL TERMINAL IN THE DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 6E.
W76-07823

SCIENTIFIC RESEARCH ARTICLES IN THE LAW OF THE SEA INFORMAL SINGLE NEGOTIATING TEXT,
Rhode Island Univ., Kingston. Law of the Sea Inst.
For primary bibliographic entry see Field 6E.
W76-07825

MAJOR ISSUES OF THE LAW OF THE SEA,
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 6E.
W76-07827

MARINE POLLUTION,
New Hampshire Univ., Durham. Law of the Sea Intern Program.
For primary bibliographic entry see Field 6E.
W76-07836

CONCLUSION,
New Hampshire Univ., Durham. Law of the Sea Intern Program.
For primary bibliographic entry see Field 6E.
W76-07842

STATUS REPORT ON LAW OF THE SEA CONFERENCE.
For primary bibliographic entry see Field 6E.
W76-07861

TWO -HUNDRED -MILE FISHING ZONE.
For primary bibliographic entry see Field 6E.
W76-07863

WATERSHED PROJECTS.
For primary bibliographic entry see Field 6E.
W76-07866

CORPS OF ENGINEERS OVERSIGHT HEARINGS - 1975,
For primary bibliographic entry see Field 6E.
W76-07869

AN EVALUATION OF THE POTENTIAL FOR ECOLOGICAL DAMAGE BY CHRONIC LOW-LEVEL ENVIRONMENTAL POLLUTION BY FLUORIDE,
California Inst. of Tech., Pasadena. Div. of Humanities and Social Sciences.
For primary bibliographic entry see Field 5C.
W76-08038

A MULTI-OBJECTIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT USING GOAL PROGRAMMING,
McGill University, Montreal, Canada, Department of Civil Engineering and Applied Mechanics.
D. Panagiotakopoulos.
Journal of Environmental Systems, Vol. 5, No. 2, p 133-147, 1975. 4 fig, 6 ref.

Descriptors: *Environment, *Management, *Wastes, *Water quality, *Optimization, Economics, Benefits, Costs, Analytical techniques, Decision making, Technology, Networks, Constraints, Biochemical oxygen demand, Air quality, Operations research, Mathematical models, Equations, Alternative planning, *Regional analysis.
Identifiers: *Multi-objective, *Goal programming, Environmental quality, Policy planning, Cost minimization.

The scope of environmental management is to reach as much as possible a socially acceptable balance between economic benefits and resulting environmental quality; such a balance is defined in terms of politically established criteria and goals. Environmental management should also be concerned with integrating the often conflicting subgoals of the economic, environmental, and technological components of the economic-environmental system into a multiple objective for guiding the development and evaluation of alternative policies. This paper presents a prescriptive framework for environmental management at the regional level which allows for a sufficiently realistic representation of the total system, deals systematically with multiple objectives through goal programming optimization techniques, and suggests an effective interaction between the decision maker and the analyst for devising compromises among conflicting objectives. This is designed as an improvement over the ad hoc trial-and-error analysis based on tradeoff relations. In essence, the procedure outlined here is directed toward establishing the economic-growth/environmental quality possibility frontier of a region. (Bell-Cornell)
W76-08072

7. RESOURCES DATA

7A. Network Design

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME I - OHIO AND WABASH RIVER BASINS,
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07570

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 2 - ILLINOIS, FOX, SANGAMON, AND KANKAKEE BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07571

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 3 - DES PLAINES RIVER BASIN.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07572

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 4 - MISSISSIPPI RIVER (SOUTH, SOUTH CENTRAL, CENTRAL, NORTH CENTRAL, NORTH), BIG MUDDY RIVER, KASKASKIA RIVER, AND ROCK RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07573

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 5 - LAKE MICHIGAN AND ITS TRIBUTARIES.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07574

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 1 - OHIO AND WABASH RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07575

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 2 - ILLINOIS, FOX, SANGAMON, AND KANKAKEE BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07576

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA - VOLUME 3, DES PLAINES RIVER BASIN.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07577

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 4 - MISSISSIPPI RIVER (SOUTH, SOUTH CENTRAL, CENTRAL, NORTH CENTRAL, NORTH), BIG MUDDY RIVER, KASKASKIA RIVER, AND ROCK RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07578

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 5 - LAKE MICHIGAN AND ITS ILLINOIS TRIBUTARIES.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 7C.
W76-07579

DATA TRANSMISSION SYSTEM MONITORS RIVER POLLUTION.
For primary bibliographic entry see Field 5A.
W76-08028

7B. Data Acquisition

ENVIRONMENTAL MONITORING THROUGH THE USE OF EXPOSURE PANELS,
William F. Clapp Labs., Inc., Duxbury, Mass.
For primary bibliographic entry see Field 5A.
W76-07490

AN APPROXIMATE ANALYSIS OF MELTING AND FREEZING OF A DRILL HOLE THROUGH AN ICE SHELF IN ANTARCTICA,
Syracuse Univ., N.Y. Dept. of Chemical Engineering and Material Sciences.
For primary bibliographic entry see Field 2C.
W76-07550

PITTSBURGH RAINWATER ANALYSIS BY PIXE,
Pittsburgh Univ., Pa.
For primary bibliographic entry see Field 5A.
W76-07555

EXTRACTION AND UTILIZATION OF SPACE ACQUIRED PHYSIOGRAPHIC DATA FOR WATER RESOURCES DEVELOPMENT,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 4D.
W76-07566

ENVIRONMENTAL ASPECTS OF RUN-OFF AND SILTATION IN THE ANACOSTIA BASIN FROM HYPERALTITUDE PHOTOGRAPHS,
Maryland Univ., College Park.
For primary bibliographic entry see Field 4D.
W76-07568

REFERENCE GUIDE TO METHODOLOGY FOR THE ANALYSIS OF ORGANIC COMPOUNDS.
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 5A.
W76-07590

MEASUREMENT AND PREDICTION OF SEDIMENT YIELDS IN WISCONSIN STREAMS,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 2J.
W76-07600

WRC AIDS UNIQUE WATER QUALITY MONITORING PROJECT.
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5A.
W76-07613

COMPARISON OF LABORATORY AND FIELD DETERMINED SATURATED HYDRAULIC CONDUCTIVITY AND PREDICTION FROM SOIL PARTICLE SIZE,
University of the West Indies, St. Augustine (Trinidad). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-07698

SATELLITES HELPING TO SOLVE DOWN-TO-EARTH CIVIL ENGINEERING PROBLEMS.
Civil Engineering (ASCE), Vol. 45, No. 8, p 49-53. 3 fig. (August 1975).

Descriptors: *Water pollution, *Remote sensing, *Satellites(Artificial), *Photography, Measurement, *Wetlands, Maping, Air pollution, Land use, Ocean currents, Pollution, Effluents.
Identifiers: *Earth Resources Technology Satellite(ERTS-1).

The Earth Resources Technology Satellite (ERTS-1) has been orbiting the earth for over 3 years and has provided insight into many problems. There are limits: the satellite can photograph a particular site only once in 18 days, the resolution of the computer enhanced information is 1 acre, and it is not always possible to make distinctions which practitioners would like. Examples of many things which are possible are given. Water pollution can be detected in lakes and oceans. On Lake Superior pollution was determined to be present near a just-completed water intake structure which was badly located. A better location could have been found if photos had been available earlier. In Lake Champlain ERTS imagery detected pollution plumes and showed the extent of surface-water degradation due to effluence from a submerged diffuser pipe extending from a paper company. Such evidence would be used in prosecution of water pollution cases. It is hoped that in the future a satellite could determine not only the location, but also the nature and concentration of a pollutant. In a Wisconsin study researchers are trying to inexpensively classify lakes as to their degree of eutriphication. Many other studies have been aided by ERTS: detection of air pollution; study of ocean currents; keeping track of strip mining; locating faults and mineral deposits; and measuring snow cover. Coastal zone states have found satellite information to be of great use in regulating activities in sensitive wetland areas. Along the Georgia coast photos have offered spectacular definition of marshlands which would be otherwise impossible. In New Jersey satellites are being used to monitor unauthorized construction in wetlands. (Smith-North Carolina)
W76-07737

A BOTTOM SEDIMENT TRAP FOR RECENT SEDIMENTARY DEPOSITS,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
For primary bibliographic entry see Field 2J.
W76-07766

ELECTROMAGNETIC REFLECTION FROM MULTI-LAYERED SNOW MODELS,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 2C.
W76-07780

APPLICATIONS OF REMOTE SENSING TO WATERSHED MANAGEMENT,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 4A.
W76-07791

THE 'RHEODROM', A NEW FLOWING WATER RESEARCH APPARATUS, (IN GERMAN),
L. Ibscher, and A. Keller.
Shweiz z Hydrol 37(1); p 187-192, 1975.

Descriptors: *Invertebrates, *Testing, Instrumentation, *Measurement.
Identifiers: Rheodrom.

The EAWAG's (Eidgenossischen Anstalt fur Wasserversorgung, Abwasserreinigung und Gewasserschutz) Rheodrom is a multi-purpose installation, built for hydraulic and ecological experiments, tests with invertebrates in running waters in particular. It is a cyclical system. Approximately 9 m3 water are recirculated through rectangular plexiglass troughs, 6 m in length, 30 cm deep and 15 cm wide. Slope, temperature (4-28C) and ground substrate are variable. Light-dark alternations can be produced externally. There is O2 saturation of the water at all times. An increase in heavy metals owing to mechanical attrition cannot be proven.--Copyright 1975, Biological Abstracts, Inc.
W76-07945

APPLICATIONS OF SHANNON'S INDEX TO THE STUDY OF INTERTIDAL VEGETATION, (IN FRENCH),
Instituto de Investigaciones Pesqueras, Vigo (Spain). Laboratorio de Investigaciones Pesqueras.
For primary bibliographic entry see Field 2L.
W76-07949

A RECIRCULATION SYSTEM FOR EXPERIMENTAL AQUARIA,
M. B. New, J. P. Scholl, J. C. McCarthy, and J. P. Bennett.
Aquaculture. 3(1), p 95-103, 1974.

Descriptors: *Aquaria, *Design, Model studies, *Recirculated water.
Identifiers: Experimentation.

A basis design for a compact, self-contained unit for experimental aquaria is described. Thirty-six 10-gallon tanks are linked in a temperature-controlled water recirculation system. Water turnover rates up to 85%/h are maintained through an upward displacement biological filter, with temperature control of plus or minus 0.1C in the system and plus or minus 0.2C between individual tanks. The complete unit occupies 36 ft2 (3.3 m2) of floor space. All tanks are easily inspected and maintenance is minimal.--Copyright 1975, Biological Abstracts, Inc.
W76-07972

PRELIMINARY NOTE ON THE OBSERVATION OF TERRIGENOUS DRIFTS INTO THE SEA, OBTAINED BY MEANS OF TELEVISED PICTURES TRANSMITTED BY ARTIFICIAL SATELLITES, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5B.
W76-07992

ULTRASONICS IN THE SEWAGE INDUSTRY,
Municipality of Metropolitan Seattle, Wash.
For primary bibliographic entry see Field 5D.
W76-08018

ON THE USE OF LITTER BAG METHOD FOR STUDYING DEGRADATION IN AQUATIC HABITATS,
Queen's Univ. Belfast (Northern Ireland). Dept. of Botany.
D. Park.
Int Biodeter Bull. 10(2), p 45-48, 1974.

Descriptors: *Sampling, Methodology, *Microbial degradation, Aquatic habitats, Rivers.
Identifiers: *Litter bag method.

The litter bag method is used to follow weight changes in filter paper immersed in a small river with a variable rate of flow. A characteristic increase in weight occurs before there is any overall weight loss. Several possible processes are considered that might contribute to accumulation of material. Eventual weight loss and breakdown of cellulose may be the result of different processes, or combinations of them, one only of which is microbial decomposition. It is argued that weight loss studies by the litter bag method do not permit a full analysis of the range of processes occuring during breakdown.--Copyright 1975, Biological Abstracts, Inc.
W76-08041

7C. Evaluation, Processing and Publication

ANALYSIS OF STRUCTURAL AND NON-STRUCTURAL FLOOD CONTROL MEASURES USING COMPUTER PROGRAM HEC-5C,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W76-07564

WATER MOVEMENT THROUGH SATURATED-UNSATURATED POROUS MEDIA: A FINITE-ELEMENT GALERKIN MODEL,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 2F.
W76-07569

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 1 - OHIO AND WABASH RIVER BASINS,
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
96 p, 3 fig. (1975)

Descriptors: *Water quality, *Illinois, *Data collections, *Ohio River, Sampling, Monitoring, Networks, Rivers, Streams, Lakes, River basins, Pollutants, Coliforms, Nutrients, Heavy metals, Suspended solids, Dissolved oxygen, Hydrogen ion concentration, Biochemical oxygen demand, Color, Turbidity, Hardness(Water), Water temperature.
Identifiers: *Wabash River basin(Ill).

The Illinois Environmental Protection Agency carries out a program of regular sampling of the streams and lakes of Illinois to determine the nature and extent of water pollution in the state, and to provide the basic water quality data necessary to carry out the agency's mission of reducing pollution of Illinois waters. This five-volume report included 1974 summary statistics for the parameters of water quality measured most frequently by the agency at 614 sampling stations which make up the Illinois Water Quality Network. Volume I presented data for all sampling points located in areas which drain either into the Ohio or Wabash Rivers. A key to headings utilized in the report was provided, along with the meaning of each. Where the heading is a measurable parameter, the meaning included the unit of expression for this parameter. Water quality parameters given for the 88 sampling points in the Ohio-Wabash drainage areas included water temperature, dissolved oxygen, pH, biochemical and chemical oxygen demand, fecal coliforms, nutrient loadings, suspended solids, turbidity, hardness, color, total plankton, oil, phenol, methylene blue active substances, heavy metals, and other pollutants. (Robinson-ISWS)
W76-07570

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 2 - ILLINOIS, FOX, SANGAMON, AND KANKAKEE BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
174 p, 3 fig. (1975).

Descriptors: *Water quality, *Illinois, *Data collections, Sampling, Monitoring, Networks, Rivers, Streams, Lakes, River basin, Pollutants, Water pollution, Coliforms, Nutrients, Heavy metals, Suspended solids, Dissolved oxygen, Hydrogen ion concentration, Biochemical oxygen demand, Color, Turbidity, Hardness(Water), Water temperature.
Identifiers: *Illinois River basin(Ill), *Fox River basin(Ill), *Sangamon River basin(Ill), *Kankakee River basin(Ill).

The Illinois Environmental Protection Agency has carried out a program of regular sampling of the streams and lakes of Illinois to determine the nature and extent of water pollution in the state, and to provide the basic water quality data necessary to carry out the agency's mission of reducing pollution of Illinois waters. This five-volume report included summary statistics for the parameters of water quality measured most frequently by the agency at 614 sampling stations which make up the Illinois Water Quality Network. Volume II presented data for all sampling points located in areas which drain into one of the following rivers: Illinois (excluding the Des Plaines River), Fox, Sangamon, and Kankakee. A key to headings utilized in the report was provided, along with the meaning of each. Where the heading is a measurable parameter, the meaning included the unit of expression for this parameter. Water quality parameters given for the 156 sampling points in the Illinois, Fox, Sangamon, and Kankakee drainage areas included water temperature, dissolved oxygen, pH, biochemical and chemical oxygen demand, fecal coliforms, nutrient loadings, suspended solids, turbidity, hardness, color, total plankton, oil, phenol, methylene blue active substances, heavy metals, and other pollutants. (Robinson - ISWS)
W76-07571

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 3 - DES PLAINES RIVER BASIN.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
154 p, 3 fig. (1975)

Descriptors: *Water quality, *Illinois, *Data collections, Sampling, Monitoring, Networks, River basins, Rivers, Streams, Lakes, Pollutants, Water pollution, Coliforms, Nutrients, Heavy metals, Suspended solids, Dissolved oxygen, Hydrogen ion concentration, Biochemical oxygen demand, Color, Turbidity, Hardness(Water), Water temperature.
Identifiers: *Des Plaines River basin(Ill).

The Illinois Environmental Protection Agency has carried out a program of regular sampling of the streams and lakes of Illinois to determine the nature and extent of water pollution in the state, and to provide the basic water quality data necessary to carry out the agency's mission of reducing pollution of Illinois waters. This five-volume report presented summary statistics for the parameters of water quality measured most frequently by the agency at 614 sampling stations which make up the Illinois Water Quality Network. Volume III contained data for all sampling points located in areas which drain into the Des Plaines River. A key to headings utilized was included, along with the meaning of each. Where the heading is a measurable parameter, the meaning included the unit of expression for this parameter. Water quality parameters given for the 136 sampling points in the Des Plaines drainage area included water temperature, dissolved oxygen, pH, biochemical and chemical oxygen demand, fecal coliforms, nutrient loadings, suspended solids, turbidity, hardness, color, total plankton, oil, phenol, methylene blue active substances, heavy metals, and other pollutants. (Robinson - ISWS)
W76-07572

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 4 - MISSISSIPPI RIVER (SOUTH, SOUTH CENTRAL, CENTRAL, NORTH CENTRAL, NORTH), BIG MUDDY RIVER, KASKASKIA RIVER, AND ROCK RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
180 p, 3 fig. (1975)

Descriptors: *Water quality, *Illinois, *Mississippi River basin, *Data collections, Sampling, Monitoring, Networks, Rivers, Streams, Lakes, River basins, Pollutants, Water pollution, Coliforms, Nutrients, Heavy metals, Suspended solids, Dissolved oxygen, Color, Turbidity, Hardness(Water), Water temperature, Hydrogen ion concentration, Biochemical oxygen demand.
Identifiers: *Big Muddy River Basin(Ill), *Kaskaskia River basin(Ill), *Rock River basin(Ill).

The Illinois Environmental Protection Agency has carried out a program of regular sampling of the streams and lakes of Illinois to determine the nature and extent of water pollution in the state, and to provide the basic water quality data necessary to carry out the agency's mission of reducing pollution of Illinois waters. This five-volume report presented summary statistics for the parameters of water quality measured most frequently by the agency at 614 sampling stations which make up the Illinois Water Quality Network. Volume IV contained data for all sampling points located in areas which drain into one of the following: Mississippi River, South; Mississippi River, South Central; Mississippi River, Central; Mississippi River, North Central; Mississippi River, North; Big Muddy River, Kaskaskia River, or Rock River. A key to headings utilized was presented, along with the meaning of each. Where the heading is a measurable parameter, the meaning included the unit of expression for this parameter. The water quality parameters given for the 164 sampling points in the Mississippi, Big Muddy, Kaskaskia, and Rock River drainage areas included water temperature, dissolved oxygen, pH, biochemical and chemical oxygen demand, fecal coliforms, nutrient loadings, suspended solids, turbidity, hardness, color, total plankton, oil, phenol, methylene blue active substances, heavy metals, and other pollutants. (Robinson - ISWS)
W76-07573

WATER QUALITY NETWORK, 1974 SUMMARY OF DATA, VOLUME 5 - LAKE MICHIGAN AND ITS TRIBUTARIES.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
49 p, 3 fig. (1975)

Descriptors: *Water quality, *Illinois, *Lake Michigan, *Data collections, Sampling, Monitoring, Networks, Lakes, Tributaries, Streams, Rivers, Pollutants, Coliforms, Nutrients, Heavy metals, Suspended solids, Dissolved oxygen, Hydrogen ion concentration, Biochemical oxygen demand, Color, Turbidity, Hardness(Water), Water temperature, Water pollution.

The Illinois Environmental Protection Agency has carried out a program of regular sampling of the streams and lakes of Illinois to determine the nature and extent of water pollution in the state, and to provide the basic water quality data necessary to carry out the agency's mission of reducing pollution of Illinois waters. This five-volume report contained summary statistics for the parameters of water quality measured most frequently by the agency at 614 sampling stations which make up the Illinois Water Quality Network. Volume V presented data for all sampling points located on Lake Michigan or its Illinois tributaries. A key to headings utilized was included, along with the meaning of each. Where the heading is a measurable parameter, the meaning included the unit of expression for this parameter. Water quality parameters given for the 40 sampling points on Lake Michigan and its tributaries included water temperature, dissolved oxygen, pH, biochemical oxygen demand, fecal coliforms, nutrient loadings, suspended solids, turbidity, hardness, color, total plankton, oil, phenol, methylene blue active substances, heavy metals, and other pollutants. (Robinson - ISWS)
W76-07574

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 1 - OHIO AND WABASH RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.

100 p, 3 fig. (1974)

Descriptors: *Water quality, *Illinois, *Data collections, *Ohio River, Sampling, Monitoring, Networks, Rivers, River basins, Streams, Lakes, Pollutants, Water pollution, Pollutant identification, Coliforms, Nutrients, Heavy metals, Suspended solids, Dissolved oxygen, Hydrogen ion concentration, Biochemical oxygen demand, Color, Turbidity, Hardness(Water), Water temperature.
Identifiers: *Wabash River basin(Ill).

The Illinois Environmental Protection Agency carries out a program of regular sampling of the streams and lakes of Illinois to determine the nature and extent of water pollution in the state, and to provide the basic water quality data necessary to carry out the agency's mission of reducing pollution of Illinois waters. This five-volume report included 1973 summary statistics for the parameters of water quality measured most frequently by the agency at 614 sampling stations which make up the Illinois Water Quality Network. Volume I contained data for all sampling points located in areas which drain either into the Ohio or Wabash Rivers. A key to headings utilized in the report was presented, along with the meaning of each. Where the heading is a measurable parameter, the meaning included the unit of expression for this parameter. Water quality parameters given for the 88 sampling points in the Ohio-Wabash drainage area included water temperature, dissolved oxygen, pH, biochemical oxygen demand, fecal coliforms, nutrient loadings, suspended solids, turbidity, hardness, color, total plankton, oil, phenol, methylene blue active substances, heavy metals, and other pollutants. (Robinson - ISWS)
W76-07575

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 2 - ILLINOIS, FOX, SANGAMON, AND KANKAKEE BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
272 p, 3 fig.

Descriptors: *Water quality, *Illinois, *Data collections, Sampling, Monitoring, Networks, Rivers, River basins, Streams, Lakes, Pollutants, Water pollution, Pollutant identification, Coliforms, Nutrients, Heavy metals, Suspended solids, Hydrogen ion concentration, Biochemical oxygen demand, Dissolved oxygen, Color, Turbidity, Hardness(Water), Water temperature.
Identifiers: *Fox River basin(Ill), *Sangamon River basin(Ill), *Kankakee River basin(Ill), *Illinois River basin(Ill).

The Illinois Environmental Protection Agency has carried out a program of regular sampling of the streams and lakes of Illinois to determine the nature and extent of water pollution in the state, and to provide the basic water quality data necessary to carry out the agency's mission of reducing pollution of Illinois waters. This five-volume report included 1973 summary statistics for the parameters of water quality measured most frequently by the agency at 614 sampling stations which make up the Illinois Water Quality Network. Volume II contained data for all sampling points located in areas which drain into one of the following rivers: Illinois (excluding the Des Plaines River), Fox, Sangamon, or Kankakee. A key to headings utilized in the report was presented, along with the meaning of each. Where the heading is a measurable parameter, the meaning included the unit of expression for this parameter. Water quality parameters given for the 157 sampling points in the drainage areas of the Illinois, Fox, Sangamon, and Kankakee rivers included water temperature, dissolved oxygen, pH, biochemical oxygen demand, fecal coliforms, nutrient loadings, suspended solids, turbidity, hardness, color, total plankton, oil, phenol, methylene blue active substances, heavy metals, and other pollutants. (Robinson-ISWS)
W76-07576

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA - VOLUME 3, DES PLAINES RIVER BASIN.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
150 p, 3 fig.

Descriptors: *Water quality, *Illinois, *Data collections, Sampling, Monitoring, *Networks, Rivers, River basins, Streams, Lakes, Pollutants, Pollutant identification, Water pollution, Coliforms, Nutrients, Heavy metals, Suspended solids, Hydrogen ion concentration, Biochemical oxygen demand, Dissolved oxygen, Color, Turbidity, Hardness(Water), Water temperature.
Identifiers: *Des Plaines River basin(Ill).

The Illinois Environmental Protection Agency has carried out a program of regular sampling of the streams and lakes of Illinois to determine the nature and extent of water pollution in the state, and to provide the basic water quality data necessary to carry out the agency's mission of reducing pollution of Illinois waters. This five-volume report included 1973 summary statistics for the parameters of water quality measured most frequently by the agency at 614 sampling stations which make up the Illinois Water Quality Network. Volume III contained data for all sampling points located in areas which drain into the Des Plaines River. A key to headings utilized was provided, along with the meaning of each. Where the heading is a measurable parameter, the meaning included the unit of expression for this parameter. Water quality parameters given for the 136 sampling points in the Des Plains River drainage area included water temperature, dissolved oxygen, pH, biochemical oxygen demand, fecal coliforms, nutrient loadings, suspended solids, turbidity, hardness, color, total plankton, oil, phenol, methylene blue active substances, heavy metals, and other pollutants. (Robinson-ISWS)
W76-07577

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 4 - MISSISSIPPI RIVER (SOUTH, SOUTH CENTRAL, CENTRAL, NORTH CENTRAL, NORTH), BIG MUDDY RIVER, KASKASKIA RIVER, AND ROCK RIVER BASINS.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
179 p, 3 fig.

Descriptors: *Water quality, *Illinois, *Mississippi River, *Data collections, Sampling, Monitoring, Networks, Rivers, River basins, Streams, Lakes, Water pollution, Pollutants, Pollutant identification, Coliforms, Nutrients, Heavy metals, Suspended solids, Dissolved oxygen, Color, Turbidity, Hydrogen ion concentration, Biochemical oxygen demand, Hardness(Water), Water temperature.
Identifiers: *Big Muddy River basin(Ill), *Kaskaskia River basin(Ill), *Rock River basin(Ill).

The Illinois Environmental Protection Agency has carried out a program of regular sampling of the streams and lakes of Illinois to determine the nature and extent of water pollution in the state, and to provide the basic water quality data necessary to carry out the agency's mission of reducing pollution of Illinois waters. This five-volume report included 1973 summary statistics for the parameters of water quality measured most frequently by the agency at 614 sampling stations which make up the Illinois Water Quality Network. Volume IV contained data for all sampling points located in areas which drain into one of the following: Mississippi River, South; Mississippi River, South Central; Mississippi River, Central; Mississippi River, North Central; Mississippi River, North; Big Muddy River, Kaskaskia River, or Rock River. A key to headings utilized was presented, along with the meaning of each. Where the heading is a measurable parameter, the meaning included the unit of expression for this parameter. Water quality parameters given for the 164 sampling points in the Mississippi, Big Muddy, Kaskaskia, and Rock River drainage basins included water temperature, dissolved oxygen, pH, biochemical oxygen demand, fecal coliforms, nutrient loadings, suspended solids, turbidity, hardness, color, total plankton, oil, phenol, methylene blue active substances, heavy metals, and other pollutants. (Robinson-ISWS)
W76-07578

WATER QUALITY NETWORK, 1973 SUMMARY OF DATA, VOLUME 5 - LAKE MICHIGAN AND ITS ILLINOIS TRIBUTARIES.
Illinois Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
82 p, 3 fig.

Descriptors: *Water quality, *Illinois, *Data collections, *Lake Michigan, *Tributaries, Sampling, Monitoring, Networks, Lakes, Rivers, Streams, Pollutants, Water pollution, Pollutant identification, Coliforms, Nutrients, Heavy metals, Dissolved oxygen, Suspended solids, Hydrogen Ion concentration, Biochemical oxygen demand, Color, Turbidity, Hardness(Water), Water temperature.

The Illinois Environmental Protection Agency has carried out a program of regular sampling of the streams and lakes of Illinois to determine the nature and extent of water pollution in the state, and to provide the basic water quality data necessary to carry out the agency's mission of reducing pollution of Illinois waters. This five-volume report included 1973 summary statistics for the parameters of water quality measured most frequently by the agency at 614 sampling stations which make up the Illinois Water Quality Network. Volume V contained data for all sampling points located on Lake Michigan or its Illinois tributaries. A key to headings utilized was presented, along with the meaning of each. Where the heading is a measurable parameter, the meaning included the unit of expression for this parameter. Water quality parameters given for the 71 sampling stations along Lake Michigan and its tributaries included water temperature, dissolved oxygen, pH, biochemical oxygen demand, fecal coliforms, nutrient loadings, suspended solids, turbidity, hardness, color, total plankton, oil, phenol, methylene blue active substances, heavy metals, and other pollutants. (Robinson - ISWS)
W76-07579

DETERMINATION OF THE FREQUENCY OF PRECIPITATION IN EXCESS OF DESIGN CRITERIA AT MORE THAN A SINGLE LOCATION DURING A HYDROLOGIC SEASON,
Missouri Univ., Columbia. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 2B.
W76-07581

AVAILABILITY OF GROUND WATER IN THE PEMIGEWASSET AND WINNIPESAUKEE RIVER BASINS, CENTRAL NEW HAMPSHIRE,
Geological Survey, Concord, N. H.
J. E. Cotton.
Water-Resources Investigations 47-75 (open-file report), 1975. 1 sheet, 3 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Available water, *Water quality, *New Hampshire, Hydrologic data, Hydrogeology, Maps.
Identifiers: *Upper Connecticut River basin(N H).

This map provides a preliminary assessment of the availability of groundwater in the Pemigewasset and Winnipesaukee River basins, central New Hampshire. It is a generalization of several hydrogeologic factors and provides a guideline for groundwater exploration which is useful in water-

and land-use planning. The most productive aquifers in the basins are deposits of stratified sand or sand and gravel of Pleistocene age. Extensive aquifers of this type occur in the Pemigewasset River valley. Aquifers of this type occur in the valleys of larger tributaries to the Pemigewasset River and in the larger valleys in the Winnipesaukee River basin. Groundwater is generally of good chemical quality, but iron and manganese in concentrations greater than the recommended limits for drinking water suggested by the U.S. Public Health Service are not uncommon. (Woodard-USGS)
W76-07589

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 2. KING AND SNOHOMISH COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-07591

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 1. CLALLAM, ISLAND, JEFFERSON, SAN JUAN, SKAGIT, AND WHATCOM COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-07592

DIGITAL MODEL OF THE GRAVEL AQUIFER, WALLA WALLA RIVER BASIN, WASHINGTON AND OREGON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2F.
W76-07593

SPRINGS OF PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 2F.
W76-07604

LAKE ERIE, OHIO, PENNSYLVANIA, NEW YORK INTAKE WATER QUALITY SUMMARY 1972,
Environmental Protection Agency, Fairview Park, Ohio.
For primary bibliographic entry see Field 5A.
W76-07610

GLACIER SURVEYS IN ALBERTA - 1971,
Canada Centre for Inland Waters, Burlington (Ontario); and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W76-07680

FLOOD PLAIN INFORMATION: CLINTON RIVER AND PAINT CREEK, OAKLAND COUNTY, MICHIGAN.
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W76-07720

FLOOD PLAIN INFORMATION: NORTH YUBA AND DOWNIE RIVERS, DOWNIEVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-07721

FLOOD PLAIN INFORMATION: ROCK RIVER-POPLAR CREEK, LUVERNE AND VICINITY, MINNESOTA.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-07722

FLOOD PLAIN INFORMATION: KETTLE CREEK, WAYCROSS AND WARE COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-07723

FLOOD PLAIN INFORMATION: HURRICANE CREEK, ALMA AND BACON COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-07724

FLOOD PLAIN INFORMATION: LITTLE CRAB ORCHARD CREEK AND PILES FORK CREEK, CARBONDALE, ILLINOIS.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-07725

FLOOD INSURANCE STUDY: PLEASANTON, ALAMEDA COUNTY, CALIFORNIA, (PRELIMINARY REPORT),
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-07726

FLOOD PLAIN INFORMATION: MINNESOTA RIVER AND TRIBUTARIES, MANKATO, NORTH MANKATO, LE HILLIER.
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 4A.
W76-07727

FLOOD PLAIN INFORMATION: GRAND RIVER, GRAND RAPIDS, MICHIGAN AND VICINITY.
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W76-07728

FLOOD PLAIN INFORMATION: MISSISSIPPI RIVER-SAUK RIVER-WATAB RIVER, VICINITY OF ST. CLOUD, MINNESOTA.
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 4A.
W76-07729

FLOOD PLAIN INFORMATION: YALOBUSHA RIVER AND TRIBUTARIES, GRENADA, MISSISSIPPI.
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W76-07730

FLOOD PLAIN INFORMATION: CEDAR CREEK, ATHENS AND CLARKE COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-07731

FLOOD PLAIN INFORMATION: FRESNO RIVER AND COTTONWOOD, LITTLE DRY, AND ROOT CREEKS, MADERA, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-07732

FLOOD PLAIN INFORMATION: MILL SLOUGH, OSCEOLA AND ORANGE COUNTIES, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-07733

FLOOD PLAIN INFORMATION: BIG THOMPSON RIVER, LOVELAND, COLORADO.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-07734

FLOOD PLAIN INFORMATION: NORTH FORK REPUBLICAN RIVER, WRAY, COLORADO.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W76-07739

PREDICTING SNOWMELT RUNOFF USING A DETERMINISTIC WATERSHED MODEL WITH STOCHASTIC PRECIPITATION INPUTS,
Arizona Univ. Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2A.
W76-07764

FLOOD ESTIMATION FROM SHORT RECORDS,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia).
For primary bibliographic entry see Field 4A.
W76-07771

AN INVESTIGATION OF THE OCCURRENCE OF OCEANIC TURBULENCE WITH RESPECT TO FINESTRUCTURE,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 2L.
W76-07773

SEASONAL VARIATIONS AND STATIONARITY,
Iceland Univ., Reykjavik. Science Inst.
For primary bibliographic entry see Field 2A.
W76-07784

WATER DATA COLLECTION AND USE,
Department of the Environment, London (England). Water Data Unit.
D. W. C. Rodda.
Water Pollution Control, Vol. 75, No. 1, p 115-123, 1976. 1 fig, 2 tab, 7 ref, 2 append.

Descriptors: *Water districts, *Data collections, Data processing, Hydrologic data, Communication, *Information exchange, *Information retrieval, *Pollutant identification, Water quality, International waters, Water transfer, *Monitoring.

The paper concerned the difference between data and information. Data were described as the quantitative evidence identifying the state or extent of something and from which inferences may be drawn. Data can be a whole series of meaningful patterns which are generated indefinitely and stored in a computer. Information is the answer to why the data appear as they do. Data are collected to gain information about the environment, what it comprises, what effect people have on it. Water data were grouped according to several functions of water authorities, and it was stated that the Water Data Unit is the main route in England along which information about all aspects of water and the water industry will be given to water authorities. A national network is being established by setting up 200 sampling stations and inter-laboratory compatibility in the analysis of water samples. Data retrieval options were discussed for planning, monitoring and control of pollution, and operations. Future needs were discussed, both for computers and human intervention for data validation. Water data collection involved the water quality for future generations and would be the basis from which authorities could set aright the ills of past generations. (Roberts - ISWS)
W76-07785

SYNTHETIC MONTHLY RUN-OFF RECORDS FOR UNGAUGED BRITISH CATCHMENTS,
Northumbrian River Authority, Gosforth (England).
For primary bibliographic entry see Field 4A.
W76-08010

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 9 AND 10. COLORADO RIVER BASIN AND THE GREAT BASIN.
Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO, Wash., DC, 20402, price $3.40. Water-Supply Paper 2158, 1976. 371 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Surface waters, *Colorado River basin, *Great basin, Basic data collections, Arizona, California, Idaho, New Mexico, Utah, Wyoming, Water analysis, Chemical analysis, Sediment transport, Partical size, Water temperature, Streamflow, Flow rates.

During the water year ending September 30, 1970, the Geological Survey maintained 154 stations on 88 streams for the study of chemical and physical characteristics of surface water in Colorado and Great River basins. Samples were collected daily and monthly at 142 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 8 and daily at 45 stations. Quantities of suspended sediment are reported for 34 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Partical-size distributions of sediments were determined at 19 stations. The stream discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. For a composite water-quality sample, the discharge is usually the average of daily mean discharges for the composite period. (Woodard-USGS)
W76-08045

WATER RESOURCES DATA FOR COLORADO, 1974: PART 2. WATER QUALITY RECORDS,
Geological Survey, Denver, Colo.
Basic-Data Report, 1975. 190 p, 1 fig, 5 tab, 32 ref.

Descriptors: *Water quality, *Surface waters, *Colorado, *Water analysis, *Chemical analysis, Physical properties, Sediment transport, Water temperature, Basic data collections, Streams, Discharge(Water).

Water quality information for Colorado surface waters collected during the 1974 water year is presented for chemical quality, fluvial sediment, and water temperatures. The chemical quality includes concentrations of individual dissolved constituents and certain properties or characteristics such as hardness, sodium-adsorption-ratio, specific conductance, and pH. Fluvial sediment information is given for suspended-sediment discharges and concentrations and for particle size distribution of suspended sediment and bed material. Water temperature data represent once-daily observations except for stations where a continuous temperature recorder furnishes information from which daily minimums and maximums are obtained. The data include a description of the sampling station and tabulations of the samples analyzed. The description of the sampling station gives the location, drainage area, periods of record for the various water-quality data, extremes of the pertinent data, and general remarks. (Woodard-USGS)
W76-08047

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1975,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2E.
W76-08049

RECORDS OF WELLS, SPRINGS, AND STREAMS IN THE POTOMAC RIVER BASIN, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va.
For primary bibliographic entry see Field 4B.
W76-08055

SURFACE-WATER RESOURCES OF THE TANGIPAHOA, TCHEFUNCTA, AND NATALBANY RIVER BASINS, SOUTHEASTERN LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 4A.
W76-08056

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1975,
Geological Survey, Lawrence, Kans.
Water-Data Report KS-75-1, February 1976. 405 p, 4 fig, 3 tab, 32 ref.

Descriptors: *Basic data collections, *Surface waters, *Groundwater, *Water quality, *Kansas, Streamflow, Gaging stations, Flow rates, Sediment transport, Observation wells, Water levels, Lakes, Reservoirs, Water analysis, Chemical analysis.

Water resources data for the 1975 water year for Kansas consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells. This report contains discharge records for 143 gaging stations; stage and contents for 20 lakes and reservoirs; water quality for 69 gaging stations; and water levels for 11 observation wells. Also included are data for 125 crest-stage partial-record stations and 23 low-flow partial-record stations. These data represent that part of the National Water Data System operated by the U. S. Geological Survey and cooperating State and Federal agencies in Kansas. (Woodard-USGS)
W76-08057

GEOHYDROLOGIC SIGNIFICANE OF LITHOFACIES OF THE CARRIZO SAND OF ARKANSAS, LOUISIANA, AND TEXAS AND THE MERIDIAN SAND OF MISSISSIPPI,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 2F.
W76-08061

MIX2: A COMPUTER PROGRAM FOR MODELING CHEMICAL REACTIONS IN NATURAL WATERS,
Geological Survey, Reston, Va.
L. N. Plummer, D. L. Parkhurst, and D. R. Kosiur.
Available from the National Techical Information Service, Springfield, Va 22161, as PB-251-668/A's $4.50 printed copy, $2.25 microfiche. Water-Resources Investigations WRI 75-61, December 1975. 68 p, 4 tab, 14 ref.

Descriptors: *Computer models, *Geochemistry, *Chemical reactions, *Inorganic compounds, *Water chemistry, Analytical techniques, *Computer programs, Mixing, Volumetric analysis, Solubility, Aqueous solutions, Chemical precipitation, Solvation, Saturation, Equilibrium, Hydrogen ion concentration, Input-output analysis, Model studies.
Identifiers: *FORTRAN IV, MIX2.

MIX2 is a FORTRAN IV computer program that utilizes an aqueous model and the constraints of mass balance and electrical balance to compute the pH and equilibrium distribution of inorganic species as a result of net reaction progress in the closed system: CaO-MgO-Na2O-K2O-CO2-H2SO4-HC1-H20. The program considers three general classes of problems involving net reaction progress: (1) mixing of two solutions in fixed volume, (2) titration of one solution into another (variable volume), and (3) the addition or subtraction of a net stoichiometric reaction to or from an aqueous solution. In addition, MIX2 will follow one phase boundary through any of the above classes of problems. This report presents the theory and method of calculation used by MIX2, describes the input to the program, presents results of two test cases, and provides a program listing. (Woodard-USGS)
W76-08062

APPLICATION OF LINEAR PROGRAMMING OPTIMIZATION TO A NORTHERN ONTARIO HYDRO POWER SYSTEM,
Environment Canada, Ottawa, Ontario, Water Planning and Management Branch.
For primary bibliographic entry see Field 4A.
W76-08074

SIZING FLOOD CONTROL RESERVOIR SYSTEMS BY SYSTEMS ANALYSIS,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W76-08085

METHODOLOGY FOR THE SELECTION AND TIMING OF WATER RESOURCES PROJECTS TO PROMOTE NATIONAL ECONOMIC DEVELOPMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-08091

8. ENGINEERING WORKS

8A. Structures

SPILLWAY GATE MODIFICATION, BONNEVILLE DAM, COLUMBIA RIVER, OREGON AND WASHINGTON, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-07792

PROPOSED KAIPAROWITS PROJECT, FINAL ENVIRONMENTAL IMPACT STATEMENT.
For primary bibliographic entry see Field 6G.
W76-07800

CORPS OF ENGINEERS OVERSIGHT HEARINGS - 1975,
For primary bibliographic entry see Field 6E.
W76-07869

LAYING 5,000 FT. OF METAL PIPE IN 24 DAYS.
Excavating Contractor, Vol. 67, No. 4, p 28, June, 1973. 2 fig.

Descriptors: *Storm drains, *Drainage systems, *Installation, Excavation, Backfill, Pipes, Construction equipment, Trenches, Manholes, Construction materials.
Identifiers: Rochester(Mich), Pipelaying.

The installation of over 5000 feet of storm drain as part of a drainage system for a 150 home subdivision in Rochester, Michigan, required more than 50 manholes and a considerable amount of ex-

cavating and backfilling work. The entire project was completed in just 24 working days averaging 200 feet per day which included excavating, pipelaying, and backfilling. Trenches were formed to a depth of eight feet and a width of six feet to provide ample room for the corrugated metal pipe specified for the installation. The pipe ranged from 12 to 42 inches in diameter. The Ray W. Malow Company of Utica, Michigan, used a Poclain RC-200 excavator in the project. (Sandoski-FIRL)
W76-07995

PAPER DRAINS DEWATER EMBANKMENT.
Engineering News Record, Vol. 190, No. 23, p 17, June 7, 1973.

Descriptors: *Drains, *Embankments, Highways, Soils, Arsenic compounds, Drainage systems, Construction costs, Pipes.
Identifiers: Paper drains, Melamine resin.

A Canadian contractor is installing paper drains instead of sand drains for the first time on a North American construction job. A Japanese-built rig that works much like a sewing machine is placing the paper drains, at a rate of 1.5 per minute, to dewater and consolidate earth below a highway embankment near Trois Rivieres, Quebec. The $350,000 contract calls for installing 8000 vertical drains to consolidate a layer of mixed silt, clay, and sand for a two-mile road section. The 4 x 1/8-inch paper strips are impregnated with arsenic salt to slow bacterial action and with melamine resin to increase their wet strength. Once in place, water is forced upward through ten small tubular channels between the outside glued faces of the drains by the weight of the embankment. Tests on other job sites in Europe and Japan show that the paper drains produce faster consolidation at a lower cost than conventional sand drains. (Sandoski-FIRL)
W76-07996

THE MAINTENANCE AND MANAGEMENT OF SEWAGE PIPE SYSTEMS (GESUIKANRO NO IJI KANRI),
Osaka Municipal Government Bureau of Sewage Works (Japan).
T. Mishiro, and M. Azuma.
Gesuido Kyokai-shi, (Journal of Japan Sewage Works Association), Vol. 10, No. 108, p 41-56, May, 1973. 6 fig, 13 tab.

Descriptors: *Sewerage, *Maintenance, *Management, Pipelines, Monitoring, Dredging, Sludge, Mud, Pipes, Storm drains, Water quality control, Data collection, Corrosion control, Inspection.
Identifiers: Osaka(Japan).

The 826 km of pipelines utilized by 700,000 people in the four districts of the Osaka Municipal Government, Japan, are serviced by a maintenance force of 109. Continuous monitoring of conditions and data collection are two of the aims, yet problems are mounting with the constant increase of sewage and the deterioration of the lines. In 1971, high pressure cleaning cars dredged 29.719 meters of pipes which is less than 10 percent of the total length. Accordingly, the dredge work maintenance is concentrated on the most problematic areas. Sludge and mud collected manually or by machine are treated by a grid collector and used for landfill. Improvement plans include replacement of the old pipeline system, the use of anti-corrosive pipes for factory areas, periodic dredge work and leveling of pipe systems where possible, installation of bypass pipes for congested areas, regular inspection and dredge work of storm runoff drainage pipes, and installation of new branch pipelines. (Seigle-FIRL)
W76-08005

ANOTHER WAY TO PUT A PIPE IN A RIVERBED,
World Construction, Vol. 26, No. 5, p 50, May, 1973. 3 fig.

Descriptors: *Pipes, *Construction, Weirs, Outlets, Mississippi River, Cooling water, Rivers, Construction materials, Engineering, Concrete pipes.
Identifiers: Power generating station, New Madrid(Mo).

Cooling water piping for the first unit of the new power generation station on the bend of the Mississippi River at New Madrid, Missouri, posed several unique engineering and construction problems. Therefore, heavy core, double prestressed concrete subaqueous pressure pipe was specified - pipe designed to take a three-edge crushing load of 855 kg/linear centimeter. With unusual river conditions the pump structure was treated as a separate unit and installed on land at the shore end of the subaqueous pipe. The intake structure was then fabricated on land and sunk into position after the pipe was laid. Standard 3.04-meter prestressed concrete pressure pipe was used from the pump structure to and from the main generating complex to the sealing weir and outfall. A 2.13-meter diameter branch line also was installed for future use. (Sandoski-FIRL)
W76-08011

PREFAB CASTING SYSTEM PACES SEWER JOB THROUGH WET SITE,
McGraw-Hill World News, Vienna (Austria).
F. H. Baer.
Construction Methods and Equipment, Vol. 55, No. 7, p 114-115, July, 1973. 5 fig.

Descriptors: *Pipes, *Construction, Construction equipment, Treatment facilities, Sewerage, Equipment, Concrete, Waste water treatment.
Identifiers: Vienna(Austria), *Prefabricated pipes.

A method of prefabricating and setting more than 650 sections of pipe required a highly mobile casting system able to advance continuously with the job as well as an intricate transport system to lift, tilt, and carry the sections to the trench for placement. Most of the pipe sections weighing 61 tons are almost 20 feet long and over 16 feet in diameter. They are cast vertically in pairs with cylindrical rebar cages encased by semi-circular steel forms. At their base, forms are socketed into portable rings of concrete and steel laid on solid ground between parallel lines of sheet piles. Two prefab pipe sections requiring 27.5 yards of concrete are poured each day by crane and bucket. A specially designed strongback-type rig handled by two 50-ton Portoli gantry cranes lifts, tilts, and then holds a pipe section horizontally while the cranes carry it to the trench for setting. The cranes work in tandem, traveling an average of 560 feet over rails laid outside the lines of sheet piles. Each pipe section is landed on two 3.25- by 10-foot semi-circular concrete blocks prefabbed onsite. The blocks, in conjunction with tongue-and-groove fixtures cast integrally with the pipe, position and join adjacent sections. After the sections are tie-bolted together, their alignment fixtures are concreted. The $2.2 million twin duct is part of a sewage treatment plant under construction for the City of Vienna, Austria. (Sandoski-FIRL)
W76-08012

WATER FLOW BINDING. TRY RELINING,
Los Angeles Memorial Coliseum and Sports Arena, Calif.
For primary bibliographic entry see Field 5F.
W76-08013

A NEW TYPE OF PLASTIC GROUND PIPE,
For primary bibliographic entry see Field 8G.
W76-08014

EXTENSION OF THE TORSHAVN BREAKWATERS,
E. Pihl & Son AS, Copenhagen, Denmark.
S. Langvad, and T. Sorensen.
Proceedings, The Institution of Civil Engineers, Part I, Design and Construction, Vol. 56, p 127-142, May 1974. 11 fig.

Descriptors: *Harbors, *Breakwaters, *Design criteria, *Storms, *Construction, Damages, Waves(Water), Atlantic ocean, Caissons.
Identifiers: *Faroe islands, North Sea, Model tests, Reconstruction.

The port of Torshavn, the most important town of the Faroe islands, is a natural port, sheltered from waves from all directions except the south east. From this direction, waves may penetrate directly from the North Sea into the port. Effective sheltering works were not constructed until recently because such works would have had to be constructed in water depths of up to 23 metres. From 1957 to 1968, an extension of the existing breakwaters was designed and investigated by model tests regarding lay-out and type of structure to be adopted. Construction was completed in 1973. The structure adopted was essentially a rubble mount breakwater provided with concrete caissons on the harbor side to allow berthing of large ships along the breakwater. During construction, a severe south-easterly gale caused extensive damage to the works. This event gave rise to a critical review of the design criteria adopted for the structure, based on a detailed analysis of the nature and causes of the damage. This paper describes the main principles of the breakwater design and the investigations upon which the design criteria were based. The method of construction and the storm damage are also described, as well as the review of design criteria following experience of the storm damage. (Bell-Cornell)
W76-08071

EXPLICIT EQUATIONS FOR PIPE-FLOW PROBLEMS,
Roorkee University, Roorkee (U.P.), India.
For primary bibliographic entry see Field 8B.
W76-08084

8B. Hydraulics

GRAYS HARBOR ESTUARY, WASHINGTON; REPORT 5, MAINTENANCE STUDIES OF 35-FT-DEEP (MSL) NAVIGATION CHANNEL; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. J. Brogdon, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-017 561, $7.75 in paper copy, $2.25 in microfiche. Technical Report H-72-2, October 1975, 206 p, 26 tab, 20 photo, 96 pl.

Descriptors: *Channel improvement, *Estuaries, *Hydraulic models, Shoals, Salinity, *Model studies, *Washington.
Identifiers: Dredged material, *Grays Harbor(Wash), Navigation channels, Current velocity, *Fixed-bed models.

The existing, comprehensive fixed-bed model of the Grays Harbor estuary was used to determine the effectiveness of three proposed dredged material areas in the estuary entrance in retaining material deposited from a hopper dredge; the effects of three proposed Sand Island Shoal Channel realignment plans on channel shoaling, current velocities, and salinities; the effects of eight proposed confined dredged material disposal islands on channel shoaling; and the effects of six channel improvement plans (training dike, groin fields, and turning/settling basin) on channel shoaling, current velocities, surface directions, salinities, and dye dispersion. Some important results of the model tests were: (1) hopper dredge disposal areas 1 and 3 were the most effective in retaining dredged material; (2) none of the three proposed Sand Island Shoal Channel realignment

plans would cause any major changes in existing current velocities or salinities; (3) channel shoaling tests conducted with proposed dredged material disposal islands installed showed that islands 2 and 8A would result in increased shoaling rates or create adverse navigation conditions; (4) no adverse effects were evident from surface-current pattern direction taken for any of the 35-ft-deep channel improvement plans. (WES)
W76-07454

SUPERCRITICAL FLOW AT OPEN-CHANNEL JUNCTIONS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer District, Los Angeles, Calif.
Report No. 2-100, July 1975. 161 p, 1 tab, 55 photo, 42 pl.

Descriptors: *Hydraulic models, Flow, *Channels, *Supercritical flow, Turbulence, Waves(Water), *Open channel flow, *Junctions, *Model studies.
Identifiers: *Confluences.

Hydraulic model tests were made to generalize and verify the hydraulic design of confluence structures. Model investigation of certain confluences showed unsatisfactory flow conditions involving considerable turbulence in the confluence structure and transverse waves in the channel downstream. Major changes in particular designs were effected. Various schemes were introduced in each case. Lengthening the transition downstream from divider wall and minimal angle of intersection of the two channels were found to be the most efficient solutions. (WES)
W76-07455

SHORE EFFECT MODEL, ATLANTIC GENERATING STATION; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. W. Whalin, J. H. Barwis, R. D. Carver, and D. D. Davidson.
Technical Report H-75-16, November 1975. 177 p, 31 tab, 32 photo, 56 pl, 3 append, 25 ref.

Descriptors: *Breakwaters, *Hydraulic models, *Nuclear power plants, *Offshore platforms, *Shores, *Shore protection, Waves(Water), *Model studies.
Identifiers: *Atlantic generating station.

A distorted-scale hydraulic model investigation was performed to determine the potential effect, if any, of a proposed offshore nuclear power plant on shoreline evolution. Model measurements of current patterns with and without the breakwater were directly compared and measurements of breaking wave characteristics (height, depth, and angle to shoreline) with and without the breakwater were used to calculate and compare longshore transport rates in the potentially affected areas. It was concluded that the proposed construction would have a negligible effect on future shoreline evolution. (WES)
W76-07457

RELIABILITY OF RUBBLE-MOUND BREAKWATER STABILITY MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. Y. Hudson.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-A011 266, $4.00 in paper copy, $2.25 in microfiche. Miscellaneous Paper H-75-5, June 1975. 42 p, 6 fig, 2 append, 25 ref.

Descriptors: *Hydraulic models, *Breakwaters, *Waves(Water), Model studies, Stability.
Identifiers: *Rubble-mound breakwaters, *Wave action.

Designing rubble-mound breakwaters to withstand the forces of wave action in such a way as to obtain safe and economical structures is difficult. It is necessary in many cases, therefore, to conduct scale-model investigations to determine the optimum design. The basis upon which rubble-mound stability models are designed, constructed, and operated is explained and information is provided from which the accuracy of such models can be appraised. Hydraulic scale models can be used to determine the stability of rubble-mound breakwaters, and the accuracy of the test results will fall within the limits required to design safe and economical prototype structures, if the model is designed and operated correctly and the test conditions are selected judiciously. (WES)
W76-07459

OUTLET WORKS FOR BELTZVILLE DAM, POHOPOCO CREEK, PENNSYLVANIA; PROTOTYPE TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. D. Hart, and C. A. Pugh.
Available from National Technical Information Service, Springfield, Va. 22161, as AD-A010-636. $4.50 in paper copy $2.25 in microfiche. Technical Report H-75-10, May 1975. 51 p, 14 fig, 4 tab, 14 pl, 7 ref, append.

Descriptors: *Outlet works, *Prototype tests, Flow, Dams, Hydrostatic pressure, Pressure, Air demand, *Hydraulic design, Intake structures, Hydraulic models, Conduits, *Pennsylvania.
Identifiers: *Beltzville Dam(Penn), *Pohopoco Creek(Penn).

Prototype measurements made at Beltzville Dam were of special interest in that (a) the prototype is very similar in design to the model (which received extensive testing prior to prototype construction); (b) the long, straight conduit aids the development of a uniform gradient; and (c) a slugtype flow known as 'burping' had been experienced at the project. Tests were conducted in the 7-ft-diam flood-control conduit and in the water-quality control intake structure. Measurements included: (a) hydrostatic pressures at seven piezometer pairs along the conduit, (b) pressure fluctuations in the conduit transition zone and downstream of the water-quality control gate, (c) air demand downstream of the control gates, (d) impact pressures in the water intake tower, (e) pressures in the converging vertical bend at the base of the wet well, and (f) high-speed motion pictures of the slug flow at the outlet portal. Good agreement was found between the comparable model and prototype data. (WES)
W76-07461

WESTPORT SMALL-BOAT BASIN REVISION STUDY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. J. Brogdon, Jr.
Available from National Technical Information Service, Springfield, Va. 22161, as AD-A018 422, $6.75 in paper copy, $2.25 in microfiche. Miscellaneous Paper H-75-8, November 1975. 167 p, 1 fig, 20 tab, 75 photo, 70 pl.

Descriptors: *Hydraulic models, *Tides, *Washington, Harbors, Model studies.
Identifiers: *Flushing, Small boat basins, *Grays Harbor(Wash), Westport(Wash).

An existing comprehensive fixed-bed model of the Grays Harbor Estuary was used to evaluate the flushing characteristics of three proposed revision plans to the existing Westport Small-Boat Basin. Model tests were conducted to determine current velocities in the two exists for basin conditions and plan 1, surface current patterns for base conditions and plans 1 and 3, and flushing characteristics for base conditions and plans 1-3. Each plan improved flushing with plan 3 being the most effective. (WES)
W76-07462

PHYSICAL HYDRAULIC MODELS: ASSESSMENT OF PREDICTIVE CAPABILITIES; REPORT 1, HYRODYNAMICS OF THE DELAWARE RIVER ESTUARY MODEL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. V. Letter, Jr., and W. H. McAnally, Jr.
Available from National Technical Information Service, Springfield, Va. 22161, as AD-012 766, $6.00 in paper copy, $2.25 in microfiche. Research Report H-75-3, June 1975 122p, 7 fig, 12 tab, 61 pl, 5 ref.

Descriptors: *Estuaries, *Hydraulic models, Tides, Pennsylvania, New Jersey.
Identifiers: *Delaware Estuary, Navigation channels, *Tidal currents.

The purpose is to define the reliability with which results of tests conducted in a physical model of the Delaware River Estuary can be used to predict the effects of modifications to the estuary. The Delaware River model at the Waterways Experiment Station was used to conduct tests to predict the effects of the navigation channel enlargement between Philadelphia and Trenton, and the results of the tests are compared with subsequent prototype data to determine the accuracy of the model predictions. Two prototype surveys provided tidal and current velocity data for the high- and low-freshwater discharge conditions in 1972, and the results of model tests duplicating those conditions were used to determine accuracy of model predictions. Tidal propagation, as measured by the range, phasing, and energy dissipation rates, was predicted as accurately as the model had been originally verified. The same is true of current velocities. It is concluded that, for projects involving estuarine modifications up to the scale of navigation channel enlargement, the physical hydraulic model, when carefully verified, can accurately predict the effects of the project on the estuarine system. (WES)
W76-07463

EFFECT OF SOURCE ORIENTATION AND LOCATION IN THE ALEUTIAN TRENCH ON TSUNAMI AMPLITUDE ALONG THE PACIFIC COAST OF THE CONTINENTAL UNITED STATES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. R. Houston, R. W. Whalin, A. W. Garcia, and H. L. Butler.
Available from National Technical Information Service, Springfield, Va. 22161, as AD-A014 145, $4.50 in paper copy, $2.25 in microfiche. Research Report H-75-4, July 1975. 48 p, 28 fig, 22 ref, append.

Descriptors: *Earthquakes, *Mathematical models, *Pacific coast region, *Tsunamis, *Alaska, Coasts.
Identifiers: *Aleutian Trench(Alaska).

An investigation was undertaken to ascertain the effect of the orientation and location of elliptically shaped tsunamigenic ground displacements of earthquakes along the Aleutian Trench on resulting tsunami amplitude along the Pacific coast of the continental United States. The Aleutian Trench was partitioned into 12 segments and a hypothetical ground displacement was centered in each segment. A numerical model was used to propagate the tsunami generated by an uplift to the Pacific coast of the continental United States. An analytical solution of the governing equations of motion was used to propagate the tsunami from the grid points of the numerical grid closest to land to a common water depth of 600 ft so that there would be a standard depth to facilitate comparisons. Contour plots of water-surface wave

elevation 3 hr after generation of the tsunamis readily depict the directional patterns of the wave radiated by the ground displacements. Plots were made of the amplitude of the leading wave of the tsunamis as a function of distance along the Pacific coast (for observation points from the Mexican border to Canada). These plots allow an evaluation of the relative vulnerability of an area along the west coast of the United States to tsunami indundation as a function of the location of a tsunamigenic earthquake along the Aleutian Trench. (WES)
W76-07464

SCALE EFFECTS IN RUBBLE-MOUND BREAKWATER STABILITY MODELS CAUSED BY VARIATIONS IN THE SPECIFIC GRAVITY OF THE ARMOR UNITS AND UNDERLAYER STONES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. Y. Hudson.
Available from National Technical Information Service, Springfield, Va. 22161, as AD-012 069, $3.50 in paper copy, $2.25 in microfiche. Miscellaneous Paper H-75-4, May 1975. 18 p, 3 fig, 6 ref, append.

Descriptors: *Rocks, *Breakwaters, *Specific gravity, *Stability, Model studies, Hydraulic models.
Identifiers: *Armor units(Hydraulics), *Rubble-mound breakwaters.

The analytical bases for obtaining dynamic similarity between model and prototype for rubble-mound stability studies were reviewed, and the results of available small-scale tests were analyzed to determine whether variations in the specific gravity of the armor units in the model, compared with the corresponding specific gravity of the prototype units, resulted in undesirable scale effects. Some of the main conclusions were: (a) Considering the Kydland and Sodefjed data, the stability number, as defined in this report, varies with the specific gravity of the armor units relative to the water in which the structure is situated; (b) considering the Waterways Experiment Station data and the relatively small variations in the specific gravities of the armor units, model to prototype, that have occurred in the model studies conducted to determine the design of the proposed Public Service Electric and Gas Company of New Jersey breakwaters, the scale effects due to the specific gravity ratio are negligible, and (c) the conclusions (a) and (b) also apply to the underlayer and core materials when they are exposed to wave action by damage to the armor-unit cover layer. (WES)
W76-07465

MASONBORO INLET, NORTH CAROLINA, MOVABLE-BED HYDRAULIC MODEL STUDY, EFFECTS OF TEMPERATURE AND EXPERIMENTAL PROCEDURES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Sager, and N. W. Hollyfield.
Miscellaneous Paper H-75-10, December 1975. 117 p, 12 fig, 3 tab, 34 pl, 11 ref, 3 append.

Descriptors: *Hydraulic models, *Water temperature, Waves(Water), *Model studies, *North Carolina.
Identifiers: *Masonboro Inlet(NC), *Movable-bed models.

The study was conducted to determine the effects of water temperature on the results from a movable-bed model study of Masonboro Inlet, North Carolina, with a secondary objective to determine the effects of experimental procedures on the model results. The erratic reproduction of short-period waves near the beach and inlet was found to be the most probable source of experimental error. Other experimental errors discussed include the influence of initial molding of the movable bed, method of simulation of littoral transport approaching the inlet test sections, and bed sounding procedure. The study did not define temperature effects on movable-bed model results; however, no evidence was found to indicate that temperature adversely affected the results of the Masonboro Inlet model tests within the range of temperatures investigated (50 to 78 deg.). A general course of action to resolve the question of temperature effects is recommended. The study consisted of three pairs of tests. Two pairs of tests were conducted with different water temperatures; the third pair was conducted with the same water temperature and was thus a 'control' series. Results of the hydrographic surveys, scour and fill maps, and beach profiles are presented in the Appendices. (WES).
W76-07466

MOBILE BAY MODEL STUDY: EFFECTS OF PROPOSED THEODORE SHIP CHANNEL AND DISPOSAL AREAS ON TIDES, CURRENTS, SALINITIES, AND DYE DISPERSION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. J. Lawing, R. A. Boland, and W. H. Bobb.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A015 475, $8.00 in paper copy, $2.25 in microfiche. Report 1, September 1975. 418 p, 15 fig, 12 tab, 30 photo, 297 pl, 4 append. Technical Report H-75-13. (App. C and D bound in separate volume).

Descriptors: *Dye dispersion, Environmental effects, *Hydraulic models, Salinity, Tides, Currents(Water), *Alabama.
Identifiers: Dredged material, *Mobile Bay(Ala), Theodore ship channel(Ala), *Salinity regimens, *Tidal currents.

The Mobile Bay model was a fixed-bed model reproducing about 268 square miles of the Gulf of Mexico from Pine Beach on the east to about the west end of Dauphin Island, all of Mobile and Bon Secour Bays, a portion of Mississippi Sound, and the Mobile and Tensaw Rivers and adjacent marshes to the junction of the two rivers at Mt. Vernon, some 40 miles upstream from Mobile. The model was equipped with the necessary appurtenances for accurate reproduction and measurement of tides, tidal currents, salinities, freshwater inflows, density effects, and other important prototype phenomena. The purpose of the model study was to determine the impact of a proposed access channel, referred to as Theodore Ship Channel, and the necessary islands designed to hold the initial construction material and subsequent maintenance dredging on salinities and flow patterns with special interest centered on the oyster industry at the lower end of Mobile Bay. The agreements attained between similar model and prototype values were considered satisfactory. The test results consist of comparable measurements of tide heights, current velocity, salinities, surface current patterns, and dye dispersion patterns for existing and proposed conditions. (WES)
W76-07467

EXPANSION OF PORT HUENEME, CALIFORNIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. G. Crosby, D. L. Durham, and C. E. Chatham, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A010 324, $5.50 in paper copy, $2.25 in microfiche. Technical Report H-75-8, April 1975. 111 p, 1 fig, 6 tab, 27 photo, 38 pl, append, 12 ref.

Descriptors: *Harbors, *Hydraulic models, *Waves(Water), Mathematical models, *Model studies, California.
Identifiers: *Port Hueneme(Cal), *Water wave generation.

A 1:100-scale model of Port Hueneme Harbor, California, and sufficient offshore area of the Pacific Ocean to permit generation of the required long-period test waves was used to investigate the effects of a proposed expansion of the harbor on mooring conditions and harbor oscillations. The proposed expansion consisted of a 710- by 450-ft extension of the east basin in a northeasterly direction. A 56-ft long wave machine and electrical wave-height measuring and recording apparatus were untilized in model operation. In addition, results obtained on two mathematical models of harbor oscillation were compared with the hydraulic model test results. It was concluded that the expansion of the east basin will not adversely affect mooring and navigation conditions in most areas of the harbor. Also the mathematical models give a reasonable good comparison with the hydraulic model within certain limitations, however further research is necessary to develop the full potential of numerical harbor oscillation models. (WES)
W76-07468

FOURMILE RUN LOCAL FLOOD-CONTROL PROJECT, ALEXANDRIA AND ARLINGTON COUNTY, VIRGINIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. R. Oswalt, J. F. George, and G. A. Pickering.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A019 826, $4.50 in paper copy, $2.25 in microfiche. Technical Report H-75-19, December 1975. 60 p, 11 fig, 1 tab, 8 photo, 20 pl.

Descriptors: *Bank protection, *Channel improvement, *Flood control, *Hydraulic models, Open channel flow, Channels, Energy dissipation, Flow control, *Virginia.
Identifiers: Alexandria(Va), Arlington County(Va), *Fourmile Run(Va).

The proposed plan for containing flood flows in the Fourmile Run Channel near Alexandria, Va. consists of eliminating existing constrictions in the channel, excavating and widening the channel, providing adequate bank-slope protection, and constructing energy dissipators, grade control structures, and flow dividers. The investigation was conducted with a 1:30-scale model that reproduced approximately 5700 ft of the Fourmile Run channel and 400 ft of the Long Branch tributary. Flow conditions through the hydraulic structures of the original design protection plan from the I-95 Bridge to just downstream of West Glebe Road Bridge were unsatisfactory for design discharges. With design discharges in the improved natural soft-bottom channel, surface waves between I-95 and West Glebe Road Bridge caused failure of the riprap on the bank slopes. Discharges exceeding 8000 cfs overtopped portions of the left slope between West Glebe Road Bridge and Long Branch and both bank slopes downstream from Mount Vernon Avenue Bridge. The proposed drop structure in Long Branch will lower the water-surface elevation to coincide with that in Fourmile Run and will reduce erosive velocities in the channel. (WES)
W76-07469

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 17-3, LONGSHORE WAVE ENERGY ANALYSES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. G. Outlaw, and D. L. Durham.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A016 900, $7.50 in paper copy, $2.25 in microfiche. Technical Report H-74-6, September 1975 176 p, 8 fig, 112 tab, 20 pl, 3 append, 19 ref.

Descriptors: *Lake Erie, *Airports, Waves(Water), Shore protection, Shores, *Ohio.

Identifiers: *Longshore waves, *Wave heights, *Cleveland(Ohio).

Monthly and annual direction distribution tables for significant wave heights and significant periods have been prepared for the west-southwest through the north to the northeast in 22.5-deg segments using hindcast data for Cleveland, Ohio, developed by A.H. Glenn and Associates of New Orleans, Louisiana. The significant height-significant period tables in the hindcast were used to distribute linearly the significant period over the monthly and annual percentages of occurrence of significant wave heights from each of specified directions. Calculated monthly and annual net longshore wave energy is estimated for 15 locations along the Lake Erie shoreline near Cleveland. The longshore energy is variable along the shoreline, but a general eastwardly net longshore direction for the wave energy is indicated by the longshore wave energy data near Cleveland. Comparison of estimated and observed noncohesive longshore transport at two sites near Cleveland with results of this study indicates that shoreline composition, geometry, and protective structures have a significant effect on longshore transport near Cleveland. An estimate for the average annual total longshore energy is given. (WES)
W76-07470

WAVE AND CURRENT CONDITIONS FOR VARIOUS MODIFICATIONS OF KEWALO BASIN, HONOLULU, OAHU, HAWAII,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
M. L. Giles.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD A016 149, $6.00 in paper copy, $2.25 in microfiche. Technical Report H-75-15, September 1975. 128 p, 3 fig, 21 tab, 68 photo, 9 pl, 9 ref.

Descriptors: *Hydraulic models, *Currents(Water), *Waves(Water), Channels, Jetties, Shoals, *Hawaii.
Identifiers: *Water wave generation, *Kewalo Basin(Hawaii), Wave absorbers.

A 1:75-scale undistorted hydraulic model of Kewalo Basin, Oahu, Hawaii, and sufficient offshore area to permit generation of the required test waves was used to develop and test several plans of improvement proposed to eliminate: (a) cross-currents in the entrance channel, (b) the presence of peaking and breaking waves in the entrance channel, and (c) undesirable wave action in the basin. Improvement plans consisted of (a) a proposed wave absorber along the channel sides, (b) various jetty plans, and (c) removal of the channel shoal. Some conclusions of the tests were: (a) Strong wave-induced crosscurrents entered the existing harbor channel for several hundred feet seaward of the existing jetty, (for some wave conditions, crosscurrents entered both sides of the channel and an eddy was formed); (b) peaking and breaking waves occurred in the existing channel for incident wave heights of 8 ft or greater, (c) wave heights up to 3.4 ft were measured in the existing basin, but piers in the basin generally prevented the formation of well-developed standing waves, (d) addition of a wave absorber along the sides of the entrance channel was the most effective improvement plan in reducing wave heights in the basin, and (e) removal of the channel shoal tended to slightly increase basin wave heights by allowing more energy to enter the harbor. (WES)
W76-07471

NAVIGATION CONDITIONS AT UNIONTOWN LOCKS AND DAM, OHIO RIVER; HYDRAULIC MODEL INVESTIGATION.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. J. Shows, and J. J. Franco.
Available from National Technical Information Service, Springfield, Va. 22161 as AD 010 639, $5.50 in paper copy, $2.25 in microfiche. Technical Report H-75-9, May 1975. 115 p, 16 fig, 22 tab, 7 photo, 29 pl.

Descriptors: *Hydraulic models, *Locks, *Dams, *Ohio River, *Model studies, Kentucky, Illinois, Indiana.
Identifiers: Uniontown Locks and Dam(Ohio River), Navigation conditions, Wabash Island(Kentucky).

As part of the program for the modernization of navigation facilities on the Ohio River, Uniontown Locks and Dam will replace some of the existing low-lift locks and dams and provide a navigable pool about 69.7 miles long to the Newburgh Locks and Dam. The model investigation was concerned with the study of the composition and configuration of the dam, arrangement of the locks and lock walls, and navigation conditions in the lock approaches. Some results of the investigation were: (a) Satisfactory navigation conditions could be developed with either the 10-gate or 12-gate spillway located in the main channel; (b) currents in the upper approach to the locks would be affected by the eddy forming in the scallop in the right bank; (c) ports would be required in the upper guard wall of the riverward lock to lessen the intensity of the crosscurrents near the end of the wall; (d) satisfactory navigation conditions could be provided with a third lock located either riverward or landward of the two adjacent locks; (e) during construction of the spillway, navigation conditions could be difficult and possibly hazardous with the first-stage cofferdam under certain flow conditions. (WES)
W76-07472

LOS ANGELES AND LONG BEACH HARBORS MODEL STUDY; REPORT 5, TIDAL VERIFICATION AND BASE CIRCULATION TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. McAnally, Jr.
Available from National Technical Information Service, Springfield, Va. 22161 as AD A016 904, $7.50 in paper copy, $2.25 in microfiche. Technical Report H-75-4, September 1975. 193 p, 8 fig, 4 tab, 97 pl, 1 append, 6 ref.

Descriptors: *Model studies, *Hydraulic models, *Harbors, California, Tides.
Identifiers: *Los Angeles Harbor(Calif), *Long Beach Harbor(Calif), Tidal currents, Tidal inlets.

The objectives of the Los Angele and Long Beach Harbors model studies are to investigate tidal circulation and basin oscillation characteristics of the existing harbors and to evaluate the impact of proposed harbor modifications upon these phenomena. A physical hydraulic model has been constructed which reproduces astronomical tides and tidal currents and is capable of reproducing wastewater discharges. The model has been verified to correctly reproduce tidal elevations, phases, current velocities, and net flows observed in the prototype. It is concluded that: (a) The model can be used to reliably predict the effect of proposed harbor modifications on tidal elevations and tidal circulation within the harbors, (b) tidal circulation within the harbors is weak for existing conditions, (c) careful design and model tests of proposed modifications should ensure that the harbor's ability to maintain adequate water quality is not impaired, and (d) a net flow toward the west in Cerritos Channel and a net flow toward the east in the outer harbor are characteristic for spring range tidal conditions. For neap tidal conditions net flow computations were inconclusive. (WES)
W76-07474

DESIGN OF JUBAIL HARBOR, SAUDI ARABIA, ROYAL SAUDI NAVAL EXPANSION PROGRAM; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
M. L. Giles, and C. E. Chatham, Jr.
Technical Report H-76-2, January 1976. 195 p, 15 fig, 33 tab, 54 photo, 50 pl, 8 ref.

Descriptors: *Harbors, *Hydraulic models, *Model studies, Breakwaters, Shore protection, Piers, *Dredging, Asia.
Identifiers: *Water wave generation, Causeways, *Jubail Harbor(Saudi Arabia), Arabian Gulf.

A 1:120-scale (undistorted) hydraulic model of the proposed Jubail Harbor site and sufficient offshore area to permit generation of the required test waves was used to investigate the arrangement and design of the proposed offshore structures with respect to wave heights at critical locations within the harbor complex. The basic harbor consisted of an offshore island connected to shore by a causeway, north and east breakwaters to provide protection for the island and an ammunition pier connected to shore by a causeway. Variations to the basic configuration included: (a) Realigning the breakwaters, (b) varying the crown elevation of the breakwaters, (c) lengthening and shortening the breakwaters, (d) adding various inner breakwaters and revetted slopes, (e) relocating the island, (f) relocating the ammunition pier, (g) additional dredging, and (h) relocating the entire harbor complex to a more shoreward location. A 24.4-m-long wave generator and electrical wave-height measuring and recording apparatus were utilized in model operation. (WES)
W76-07475

OUTLET WORKS FOR TAYLORSVILLE LAKE, SALT RIVER, KENTUCKY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
M. S. Dortch.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A014 974. $4.50 in paper copy, $2.25 in microfiche. Technical Report H-75-12, August 1975. 57 p, 7 fig, 5 tab, 5 photo, 16 pl.

Descriptors: *Hydraulic models, *Outlet works, *Stilling basins, *Conduits, Flow, Flood control, *Kentucky.
Identifiers: *Taylorsville Lake(Ky), *Salt River(Ky).

Model investigation of the outlet works for Taylorsville Lake was concerned with verification and improvement of the hydraulic design of the intake structure, conduit, and stilling basin. The study was conducted in a 1:25 scale model of the outlet works which reproduced a portion of the approach area, the intake structure, the outlet conduit, the hydraulic-jump type stilling basin, and approximately 120 ft of exit channel. The proposed intake structure provided effective regulation of both flood-control and water-quality releases. Flow and pressure conditions were satisfactory for all expected operating schemes. Performance of the original design stilling basin was unacceptable as unstable hydraulic action in the basin resulted in poor energy dissipation. Eddy formation throughout the lower range of discharges was a difficult problem to overcome because of the relatively low elevation of the outlet portal invert with respect to the tailwater elevation. Single or uneven gate operation produced unbalanced flow in the stilling basin; however, the eddies were not as severe as in the original design. (WES)
W76-07476

DESIGN OF ENTRANCE CHANNEL IMPROVEMENTS FOR LUDINGTON HARBOR, MICHIGAN; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.

L. G. Crosby, and C. E. Chatham, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A016 148, $5.00 in paper copy, $2.25 in microfiche. Technical Report H-75-14, September 1975, 70 p, 2 fig, 12 tab, 29 photo, 7 pl, 6 ref.

Descriptors: *Breakwaters, *Channel improvement, Channels, *Harbors, *Hydraulic models, *Model studies, *Michigan, Lake Michigan.
Identifiers: Water wave generation, *Wave absorbers, Ludington Harbor(Mich), *Pere Marquette Lake(Mich).

A 1:100-scale model of Ludington Harbor, Michigan, including about two-thirds of Pere Marquette Lake and sufficient offshore area of Lake Michigan to permit generation of the required test waves, was used to investigate the effects of a proposed harbor entrance improvement plan on wave action in the harbor. Modifications to the basic plan which were tested consisted of several wave absorber designs along the inner entrance channel and raising the crown elevation of the north and south breakwaters to prevent wave overtopping. A 50-ft-long wave generator and a computer-controlled electrical wave height measuring and recording system were used in model operation. Some conclusions from model test results were: (a) The basic plan of improvement substantially increased wave heights in the entrance channel and in the vicinity of the car ferry docks; (b) the channel improvement plan did not significantly change existing current patterns; (c) inclusion of a rubble-mound breakwater by the small boat launching ramp in the outer basin was effective in reducing wave heights at the ramp; (d) an additional reduction in wave heights in the entrance channel and at the car ferry docks was accomplished by raising the crown elevation of the north and south breakwaters to prevent overtopping; and (e) raising the crown elevation of the breakwaters altered current patterns slightly. (WES)
W76-07477

DESIGN OF AGANA SMALL-BOAT HARBOR, TERRITORY OF GUAM; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. E. Chatham, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A005 146, $6.00 in paper copy, $2.25 in microfiche. Technical Report H-75-1, January 1975. 132 p, 5 fig, 7 tab, 12 photo, 83 pl, 6 ref.

Descriptors: *Hydraulic models, *Harbors, *Waves(Water), Channels, Breakwaters, Pacific Ocean.
Identifiers: *Agana Harbor(Guam), Small boat basins, *Guam, Water wave generation, Wave absorbers, Wave action.

A 1:50-scale undistorted hydraulic model of Agana Harbor, the surrounding reef, and sufficient offshore area to permit generation of the required test waves was used to investigate the arrangement and design of proposed harbor improvements with respect to wave heights and wave-induced circulation conditions. The basic harbor configuration consisted of a new berthing basin, an access channel, a revetted landfill (including an area for a sewage treatment plant), east and west breakwaters, a wave absorber, and circulation channels. Some conclusions from the test results were: (a) No excessive wave heights were recorded in the existing harbor basins, but very confused wave and current patterns were present at the harbor entrance; (b) wave-induced circulation on the reef and in the existing entrance channel was good for all test conditions, but circulation in the existing harbor basins was generally poor; (c) addition of the beach to the west of the sewage treatment plant landfill improved circulation in this area, but for some wave conditions slack-water areas were observed (similar to the beach west of the existing harbor basins); (d) removal of either the east or west breakwater (or both) resulted in strong crosscurrents in the entrance channel; (e) the box culverts proposed for the circulation channels reduced the effectiveness of these channels, indicating that a bridge would be the best means of access to the outer-fill areas. (WES)
W76-07478

FORM, GENESIS, AND DEFORMATION OF CENTRAL CALIFORNIA WAVE-CUT PLATFORMS,
Colorado Univ., Boulder. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2L.
W76-07552

NUMERICAL CALCULATION OF THE WAVE INTEGRALS IN THE LINEARIZED THEORY OF WATER WAVES,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
H. T. Shen, and C. Farell.
IIHR Report No. 106, November 1975. 55 p, 4 fig, 2 tab, 19 ref, 2 append. ONR N00014-68-A-0196-0004, N00014-76-C-0012

Descriptors: *Waves(Water), *Hydrodynamics, *Numerical analysis, *Computer programs, Ships, Analytical techniques, Algorithms, Methodology, Resistance.
Identifiers: *Wave integrals, Wave resistance, Submerged bodies.

A method for the numerical evaluation of the derivatives of the linearized velocity potential for three-dimensional flow past a unit source submerged in a uniform stream was presented together with a discussion of existing techniques. It was shown in particular that calculation of the double integral term in these functions can be efficiently accomplished in terms of a single integral with the integrand expressed in terms of the complex exponential integral, for which numerical computing techniques are available. Fortran programs prepared for evaluation of the first-order derivatives in connection with the calculation of second-order nonlinear contributions to the wave resistance of a body were appended. (Singh-ISWS)
W76-07565

AQUIFER TESTS IN THE SUMMIT REACH OF THE PROPOSED CROSS-FLORIDA BARGE CANAL NEAR OCALA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W76-07599

SUMMARY OF RESEARCH IN ENGINEERING (COMPLETED AND IN PROGRESS), 1973-1974.
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 9A.
W76-07787

COASTAL EROSION HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Rutgers - The State Univ., New Brunswick, N. J.
For primary bibliographic entry see Field 2L.
W76-07788

SPILLWAY GATE MODIFICATION, BONNEVILLE DAM, COLUMBIA RIVER, OREGON AND WASHINGTON, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
T. D. Edmister, and P. M. Smith.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-011 397, $4.00 in paper copy, $2.25 in microfiche. Technical Report No. 136-1, May 1975. 43 p, 23 fig, 10 tab.

Descriptors: *Model studies, *Hydraulic models, *Bonneville dam, *Spillways, *Hydraulic gates, *Columbia River, Structures, Hydraulic structures, Dams, Spillway crests, Vibrations, Flow, Hydraulic design, Hydraulics, Oregon, Washington.

Model investigation verified that vertical vibration of the Bonneville spillway gates was caused by flow instability beneath the gate. When the gate bottom was submerged by tailwater and the gate was at certain openings, the line of flow control shifted back and forth between the gate seal near the center of the bottom and the upstream face of the gate. Pressure changes accompanying the control shifts created large changes in vertical force on the upstream half of the gate bottom. A bottom shape with a longer lip for better flow control was developed. The new shape was structurally feasible, usable in either set of existing gate slots without modification of embedded seal plates, and operable at all gate openings with negligible vertical vibration. Other shapes not usable with existing seal plates were developed but were considered less suitable. Model measurements indicated that the maximum discharge of 14 spillway bays with the maximum regulated pool (elev 75.5), individual gate hoists in place, and a powerhouse discharge of 132,000 cfs would be 693,000 cfs (river discharge 825,000 cfs). The pool energy grade line required to pass the spillway design discharge of 1,600,000 cfs was elev 87.0. The probable maximum flood of 2,100,000 cfs could pass through 18 bays of the spillway with a pool energy grade line of elev 104.3. With that condition, flow constriction by the spillway bridge would cause orifice flow through the bays. Average water surface at the spillway would be 0.5 ft below the top of the bridge parapet, but surging would raise the surface 3 ft above the top. (Sims - ISWS)
W76-07792

EXPLICIT EQUATIONS FOR PIPE-FLOW PROBLEMS,
Roorkee University, Roorkee (U.P.), India.
P. K. Swamee, and A. K. Jain.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. HY5, Proceedings paper No. 12146, p 657-664, May 1976. 2 fig, 10 ref.

Descriptors: *Discharge(Water), *Head losses, *Hydraulics, *Pipe flow, Friction, Darcy-Weisbach equation, Hydraulic properties, Pipes.

Direct solutions of pipe flow problems are not possible because of the implicit form of Colebrook-White equation which expresses the hydraulic resistance of commercial pipes. The three basic and major problems encountered in hydraulic engineering practice are the determination of pipe diameter, the discharge and the head loss. The solution of these problems on conventional lines involves many trials and tedious computations. Some research workers have proposed graphical solutions which have their own inherent limitations. Reported herein are explicit and accurate equations for pipe diameter and head loss and a closed form solution for the discharge through the pipe, based on Colebrook-White equation. These explicit equations can also be utilized with advantage in optimization studies of pipelines and water distribution systems. (Bell-Cornell)
W76-08084

8C. Hydraulic Machinery

THE WATER AND TOTAL OPTIMIZATIONS OF WET AND DRY-WET COOLING TOWERS FOR ELECTRIC POWER PLANTS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 3E.
W76-07674

DEVELOPMENT OF DESIGN GUIDELINES FOR SHIPBOARD SEWAGE HOLDING TANKS.
For primary bibliographic entry see Field 5D.
W76-07677

DEVELOPMENT OF DESIGN GUIDELINES FOR SHORE -SIDE HOLDING TANKS.
For primary bibliographic entry see Field 5D.
W76-07681

GEOTHERMAL ENERGY DEVELOPMENT.
For primary bibliographic entry see Field 6E.
W76-07865

DEVELOPMENT OF AN OPTIMUM DESIGN SIMULATION FOR SCREW PUMP PLANTS AND ITS APPLICATION FOR THE ICHIHARA MUNICIPAL DRAINAGE PUMP PLANT (SUKURYU PONPUJO SAITEKI SEKKEI SHIMURESHON NO KAIHATSU TO ICHIHARA-SHI ICHIHARA USUI HAISUI PONPUJO E NO TEKIYOREI),
T. Ito, I. Inoue, and R. Kozato.
Gesuido Kyokai-shi, (Journal of Japan Sewage Works Association), Vol. 10, No. 108, p 24-40, May, 1973. 19 fig, 13 tab.

Descriptors: *Pumping plants, *Pumps, Storm runoff, Sewage, Model studies, Costs, Design, Construction, Drainage, Simulation.
Identifiers: Screw pumps, Rainfall runoff, Rotation pumps.

Studies made for the Ichihara City, Japan, drainage pumping plant which is now in the design and construction stage, were based on a cost-down achieved by increasing the rotation speed of the pumps. The system is to be constructed on a general theory concept and adjusted to the actual conditions of the site with the plant being able to treat both storm runoff and sewage. Screw pumps are to be used on one level and the limit of lift head determined by the level of elevated water. The rain quantity, rain runoff, and sewage simulation systems will be constructed with the initial cost and the running cost calculated from the first year expenses. An optimum system designed by comparing the costs of various combinations of high rotation pumps and base pumps of various mouth sizes was determined to include nine high rotation pumps with 3000 mm diameter mouths and two combination pumps of high rotation and base pumps. (Seigle-FIRL)
W76-08001

SEWER ALARM SYSTEM SAVES TAXPAYERS' DOLLARS,
Milford Dept. of Public Works, Conn.
For primary bibliographic entry see Field 5D.
W76-08030

8D. Soil Mechanics

DETECTION OF INCIPIENT FAILURE IN EARTH DAMS,
Missouri Univ., Rolla.
D. Rechtien, and L. W. Gardner.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-252 942, $3.50 in paper copy, $2.25 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, March 26, 1976. 21 p, 9 fig, 6 ref. OWRT A-073-MO(1). 14-31-0001 - 4025 and 5025.

Descriptors: *Earth dams, *Vibrations, Earthquakes, *Dam failure, Monitoring, Seasonal, *Earthquake engineering, Seismic studies, Nondestructive tests, Structural stability.

A study was made of the dynamic properties of small dams by means of exciting the dam with a mechanical vibrator. The objective was to explore the reliability of the dynamic response parameters to detect incipient failure. Severe limitations within the mechanical vibrator limited the scope of this study to the investigation of the repeatability of the dynamic response to seasonal variations. The repeatability was extraordinary. It is believed, because of this repeatability, that incipient failure causing a change in the dynamic characteristics of the dam could be detected with repeated monitoring of the mechanical response of the structure.
W76-07671

8E. Rock Mechanics and Geology

EFFECT OF SOURCE ORIENTATION AND LOCATION IN THE ALEUTIAN TRENCH ON TSUNAMI AMPLITUDE ALONG THE PACIFIC COAST OF THE CONTINENTAL UNITED STATES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-07464

8F. Concrete

4000-FOOT OUTFALL HAS 640-FOOT DIFFUSER FOR OCEAN DISPERSAL.
For primary bibliographic entry see Field 5E.
W76-08002

ANOTHER WAY TO PUT A PIPE IN A RIVERBED,
For primary bibliographic entry see Field 8A.
W76-08011

PREFAB CASTING SYSTEM PACES SEWER JOB THROUGH WET SITE,
McGraw-Hill World News, Vienna (Austria).
For primary bibliographic entry see Field 8A.
W76-08012

8G. Materials

DETECTION OF INCIPIENT FAILURE IN EARTH DAMS,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 8D.
W76-07671

A NEW TIGHT FIT - INSERTION OF A PLASTIC LINER IN A 42 INCH SEWER.
Public Works, Vol. 104, No. 6, p 98-99, June, 1973. 5 fig.

Descriptors: *Plastic pipes, *Sewers, Plastics, Joints(Connections), Concrete pipes, Construction equipment, Rehabilitation, Construction materials, Pipelines, Manholes, Texas, Sewerage.
Identifiers: Houston(Tex), Polyethylene, Sewer repair.

Since September 1972, a major project in Houston, Texas, has been the insertion of a 36-inch plastic pipe in a 42-inch concrete sewer. This was the first time lining a sewer of this size had been attempted and there were many problems, such as sewer cleaning during inclement weather. The pipe inserted is Mono-Line, furnished by Joseph T. Ryerson and Son, Incorporated. It is constructed of high-density polyethylene with an outer diameter of 35.433 inches and an inner diameter of 33.237 inches and weighs about 51.4 pounds per foot. It is shipped in 39-foot sections. Generally, the sections are joined above ground in the desired lengths, using a heater plate for welding. When sections were joined underground, joints were made with Dresser couplings and stabilized sand was used to surround the joints. A total of 2000 feet of concrete line was rehabilitated in the project. The first insertion amounted to 1750 feet. Special equipment was devised to permit pulling the pipe very slowly using a 7/8-inch cable and a 600 to one geared cable drum. Inverted nose cones were inserted in both ends so that assembled sections would be pulled in either direction as required. Jacks were then erected at manholes to reinforce the structures against the pulling force. The pipe was supported during the operation by a sling from a crane mounted on a tractor. Pipe ends were equipped with casters to ease sliding of the insertion sections in place. (Sandoski-FIRL)
W76-07994

PAPER DRAINS DEWATER EMBANKMENT.
For primary bibliographic entry see Field 8A.
W76-07996

LARGEST PVC FILTER INSTALLATION.
Public Works, Vol. 104, No. 6, p 106, June, 1973. 1 fig.

Descriptors: *Waste water treatment, *Trickling filters, Water pollution control, Municipal wastes, Industrial wastes, Filtration, Biological treatment.
Identifiers: Stockton(Calif), Polyvinyl chloride, Filter media.

The largest known installation of polyvinyl chloride trickling filters for waste water treatment is to be completed by December at Stockton, California. Nearly 1.5 million cubic feet of B. F. Goodrich Koroseal Vinyl Core filter media will be required to fill three towers, each 22 feet high and 166 feet in diameter. The new towers will take the place of three rock media filters in an expansion and upgrading of the main municipal water pollution control plant at Stockton, which treats both municipal and industrial waste water. (Sandoski-FIRL)
W76-07998

A NEW TYPE OF PLASTIC GROUND PIPE,
Water and Wastes Engineering, Vol. 10, No. 7, p 13, July, 1973.

Descriptors: *Plastic pipes, *Construction materials, Water distribution(Applied), Polymers, Pipelines.
Identifiers: Water transmission, Japan.

Seventeen hundred feet of 40-inch diameter nylon-reinforced plastic pipe that left a Japanese factory in a soft, coiled condition and was flown to the United States, was fed into a heating device carried behind a truck and emerged fully hardened and prepared for service. The pipe is adaptable for water transmission and certain water distribution systems, especially for longer pipe runs. Constructed of a special compound polymer and high tensile synthetic yarn, Takata H. F. pipe is said to be capable of being manufactured at strengths up to 300 psi. It is made and installed in essentially endless lengths. The pipe is economically competitive. (Sandoski-FIRL)
W76-08014

8I. Fisheries Engineering

FISHERIES AND ENERGY PRODUCTION: A SYMPOSIUM,
For primary bibliographic entry see Field 5C.
W76-07487

SIMULATING THE IMPACT OF THE ENTRAINMENT OF WINTER FLOUNDER LARVAE,
Rhode Island Univ., Kingston. Marine Experiment Station.
K. W. Hess, M. P. Sissenwine, and S. B. Saila.
In: Fisheries and Energy Production: A Symposium. p 1-29, 1975, 11 fig, 3 tab, 13 ref.

Descriptors: *Entrainment, *Larvae, *Model studies, Nuclear energy, Population, Connecticut, Simulation analysis.
Identifiers: Millstone Point(Conn).

Winter flounder larvae in the vicinity of Millstone Point, Conn. are transported by diffusion and by tidal action. Computer simulations were used to predict the numbers of larvae which could be entrained during the operation of a nuclear power station. A tidal hydrodynamic model simulated currents and water levels. A transport model simulated concentration of larvae. The integrated simulations of biological and hydrodynamic systems suggested that the potential impact of entrainment on the winter flounder of the Niantic River is less than a 1% reduction in year-class strength with a 6% reduction in population size after 35 years of plant operation. (See also W76-07487) (Chilton-ORNL)
W76-07488

THE MECHANICAL EFFECTS OF WATER FLOW ON FISH EGGS AND LARVAE,
Maryland Univ., Solomons, Md. Chesapeake Biological Lab.
R. E. Ulanowicz.
In: Fisheries and Energy Production: A Symposium. p 77-87, 1975. 1 fig, 1 tab, 21 ref.

Descriptors: *Entrainment, *Stress, *Damages, *Fish eggs, *Larvae, Plankton, Shear stress, Abrasion, Pressure.
Identifiers: Acceleration, Impaction.

While the impact of mechanical stresses on ichthyoplankton entrained in power plant cooling systems has long been considered negligible, this may not be true in nuclear power plants because of their greater water use. Three major physical forces which might cause mechanical damage to fish eggs and larvae are pressure change, acceleration and shear stress. Exhaustive research is required to define the ranges of pressure change, acceleration, impaction, shear, and abrasion which cause mortality of various entrained fishes and invertebrates. (See also W76-07487) (Chilton-ORNL)
W76-07491

ENTRAINMENT OF ORGANISMS AT POWER PLANTS, WITH EMPHASIS ON FISHES - AN OVERVIEW,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
For primary bibliographic entry see Field 5C.
W76-07492

LABORATORY AND FIELD TEMPERATURE PREFERENCE AND AVOIDANCE DATA OF FISH RELATED TO THE ESTABLISHMENT OF STANDARDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-07494

EXPERIMENTS RELATED TO DIRECTING ATLANTIC SALMON SMOLTS, SAIMO SALAR, AROUND HYDROELECTRIC TURBINES,
Fisheries and Marine Service, Halifax (Nova Scotia). Resource Development Branch.
J. R. Semple, and C. L. McLeod.
In: Fisheries and Energy Production: A Symposium, p 141-165, 1975. 6 fig, 4 tab, 28 ref.

Descriptors: *Engineering structures, *Bypasses, *Fish, Diversion structures, Smolt, *Salmon, Turbines, Hydroelectric plants.

A fish by-pass and a floating-screen deflector were used to direct smolts around the hydroelectric turbines of a power station on the Tusket River in southwestern Nova Scotia. Deflection angle of floating-screen device was the most important factor for increasing smolt guidance efficiency. The most efficient deflector array for smolt guidance of those tested was one in which the deflector screens were operated to a depth of 2.44 m without a sounding lip and at an angle of 45 degrees to the direction of flow. Under these conditions an average bypass efficiency of 72.1% was achieved. (See also W76-07487) (Chilton-ORNL)
W76-07495

THE EFFECTS OF TWO ELECTRICAL BARRIERS ON THE ENTRAINMENT OF FISH AT A FRESHWATER NUCLEAR POWER PLANT,
Rhode Island Univ., Kingston. Marine Experiment Station.
M. A. Hyman, W. H. Mowbray, and S.B. Saila.
In: Fisheries and Energy Production: A Symposium, p 205-237, 1975. 3 fig, 7 tab, 21 ref.

Descriptors: *Entrainment, *Barriers, *Electrical equipment, Fish, Nuclear powerplants.
Identifiers: Connecticut Yankee Atomic Power Plant.

Two electrical barriers designed to discourage the presence of fish from intakes at the Connecticut Yankee Atomic Power Plant at Hadam Neck, Conn. are described. Both systems statistically reduced the number of fish entrained. A study showed that the system offers a potential for selectivity. Based on seasonality, natural abundance or ecological importance, the system can be adjusted to minimize certain groups. With the installation of conduit electrode arrays in four bays, the impingement of fish greater than 15 cm of five species was reduced 68 to 82% over previous levels. (See also W76-07487) (Chilton-ORNL)
W76-07497

PRELIMINARY REPORT ON WATER AVAILABILITY IN THE LOWER SHIP CREEK BASIN, ANCHORAGE, ALASKA--WITH SPECIAL REFERENCE TO THE FISH HATCHERY ON FORT RICHARDSON AND A PROPOSED FISH-HATCHERY SITE NEAR THE ELMENDORF AIR FORCE BASE POWERPLANT,
Geological Survey, Anchorage, Alaska.
G. W. Freethey.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251-517, $4.00 printed copy; $2.25 microfiche. Water-Resources Investigations 48-75, January 1976. 21 p, 12 fig, 16 ref.

Descriptors: *Available water, *Fish hatcheries, *Alaska, Hydrologic data, Reviews, Surface waters, Groundwater, Hydrogeology, Aquifer characteristics, Evaluation.
Identifiers: *Lower Ship Creek basin(Alaska), *Anchorage(Alaska).

The availability of surface water and shallow groundwater in the lower Ship Creek basin, Anchorage, Alaska, was examined using 28 years of streamflow records and well logs. Streamflow gains and losses were estimated from 23 seepage investigations made since May 1957. A contour map of the top of the principal confining stratum and an isopach map of the saturated material were made in order to locate areas with the greatest potential for unconfined groundwater development. An adequate supply of water needed for further development of the Fort Richardson fish hatchery probably is available downstream from that site from unconfined groundwater sources. Unconfined groundwater upstream from that site probably would not fulfill the water requirements of the hatchery. At the proposed fish-hatchery site on Elmendorf Air Force Base, it probably is not possible to withdraw the required water either from a system of wells in the unconfined groundwater zone or from Ship Creek during periods of low flow. Two areas upstream from the site offer better potential for unconfined groundwater development. (Woodard-USGS)
W76-07595

INTENSIFIED FISH CULTURE COMBINING WATER RECONDITIONING WITH POLLUTION ABATEMENT,
Kramer, Chin and Mayo, Seattle, Wash.
For primary bibliographic entry see Field 5G.
W76-07711

REPRODUCTION OF THE BANDED KILLIFISH: FUNDULUS DIAPHANUS DIAPHANUS (LE SUEUR), (IN FRENCH),
Service Faune Auebec, St. Faustin. Station for Pisciculture.
For primary bibliographic entry see Field 2H.
W76-07937

GNAWING AT FISHING NETTING: A PROBLEM IN CAGE-RAISING OF HERBIVOROUS FISH,
Fisheries Technology Unit, Haifa (Israel).
M. Ben-Yami.
Aquaculture. 3(2), p 199-202, 1974.

Descriptors: Fish, *Herbivores, *Nets, Forage fish, Algae.
Identifiers: Cages, Israel, Red Sea, Siganus-Rivulatus, *Rabbitfish.

Rabbitfish (Siganus rivulatus) have been experimentally reared in the Gulf of Eilat (Red Sea, Israel). Rabbitfish fingerlings were grown in improvised floating cages. In early spring 1972, these cages were stocked with juvenile rabbitfish which were fed and kept under observation. Two months later holes appeared in the small-mesh netting, and that signs of twine deterioration appeared in many places. As a result, many fish escaped. Microscopic examinations were made. These showed that the twine of the netting after prolonged and uninterrupted exposure in the Gulf's water was covered with a thick growth of algae and that the damage to the netting was caused by cutting of some or all of the filaments in the twine. The herbivorous rabbitfish had been attracted to the algae covering the twine, and gnawed at both the algae and the twine.--Copyright 1975, Biological Abstracts, Inc.
W76-07970

OBSERVATIONS ON THE BREEDING AND GROWTH OF THE GIANT FRESHWATER PRAWN MACROBRACHIUM ROSENBERGII (DE MAN) IN THE LABORATORY,
Ministry of Agriculture, Fisheries and Food, Conway (Wales). Shellfish Culture Unit.
J. F. Wickins, and T. W. Beard.
Aquaculture. 3(2), p 159-174, 1974.

Descriptors: *Breeding, *Reproduction, Growth rates, *Freshwater fish, *Shrimp.
Identifiers: Macrobrachium-Rosenbergii, *Prawns.

Three male and 20 female M. rosenbergii were observed for 390 days. Mating occurred readily and eggs were incubated for 20 days. The mean number of larvae per brood was 24,000. Larger

females had proportionately larger broods. Larvae from 7 broods were cultured to the post-larval stage. The increase in length of the adults at each molt was constant (arithmetic growth) and did not alter when ova were maturing in the ovary. Prawns achieved larger mean length increments after the environmental conditions were improved. The molting frequency was very variable and, with 1 exception, did not change proportionately with length or age of the prawns. Females grew from 115-205 mm and males from 145-230 mm total length. Three females spawned more than 4 times in successive intermolt periods, and one produced viable larvae 5 times in succession. Two of the males sired viable larvae 4 and 7 times respectively during 1 intermolt period.--Copyright 1975, Biological Abstracts, Inc.
W76-07971

A RECIRCULATION SYSTEM FOR EXPERIMENTAL AQUARIA,
For primary bibliographic entry see Field 7B.
W76-07972

BIOLOGY OF THE CARP IN THE MINGECHAUR RESERVOIR, (IN RUSSIAN),
For primary bibliographic entry see Field 2H.
W76-07987

INFLUENCE OF WATER TEMPERATURE ON INCUBATION AND HATCHING IN CHONDROSTOMA NASUS (LINNAEUS 1758),
Ceskoslovenska Akademie Ved, Brno. Ustav pro Vyzkum Obratlovcu.
M. Penaz.
Zool Listy. 23(1), p 53-59, 1974.

Descriptors: *Water temperature, *Incubation, *Fish hatcheries, Fish eggs, *Embryonic growth stage, Fish reproduction.
Identifiers: *Chondrostoma-Nasus.

The duration of incubation of eggs in C. nasus is dependent on both the mean water temperature during the whole incubation and on water temperature during hatching. At a constant water temperature of 10C., the incubation lasts 23 days and 3 h on the average; at a constant water temperature of 15C., 8 days and 4.5 h. Higher temperatures prevailing during hatching accelerate hatching considerably. The degree of development at which the embryos hatch depends on water temperature during incubation. At lower temperatures, more advanced and larger embryos will hatch. The optimum temperature regime for artificial propagation of C. nasus and possible causes of the disappearance of the species from stream sections whose temperature regime was affected by the erection of river dams are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-08053

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER PROBLEMS AND RESEARCH NEEDS FOR HAWAII: 1975,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W76-07584

SUMMARY OF RESEARCH IN ENGINEERING (COMPLETED AND IN PROGRESS), 1973-1974.
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
Engineering Research Bulletin No. 115, 1975. 40 p.

Descriptors: *Research and development, *Projects, *Research facilities, *Engineering, *Louisiana, Chemical engineering, Civil engineering, Electrical engineering, Mechanical engineering, Nuclear engineering, Oil industry, Engineering personnel, Hydraulic engineering, Environmental engineering, Engineering education.

Engineering research projects at Louisiana State University were briefly summarized. Each summary included the sponsor of the project, personnel, objectives, and results. Project summaries were presented for work in these departments: (1) Chemical Engineering, (2) Civil Engineering, (3) Division of Engineering Research, (4) Electrical Engineering, (5) Engineering Science, (6) Mechanical, Aerospace and Industrial Engineering, (7) Nuclear Science, and (8) Petroleum Engineering. A partial list of bulletins, reports, and journal papers from these organizations was included. (Sims - ISWS)
W76-07787

9C. Research Facilities

SUMMARY OF RESEARCH IN ENGINEERING (COMPLETED AND IN PROGRESS), 1973-1974.
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 9A.
W76-07787

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

RIVER POINT DIRECTORY FOR THE MISSISSIPPI RIVER-GULF COAST INLAND WATERWAYS SYSTEM,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2L.
W76-07458

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 02H.
W76-07563

ANNOTATED BIBLIOGRAPHY OF TEXAS WATER RESOURCES REPORTS OF THE TEXAS WATER DEVELOPMENT BOARD AND UNITED STATES GEOLOGICAL SURVEY THROUGH AUGUST 1974,
Geological Survey, Austin, Tex.
C. D. Friebele, and H. A. Wolff.
Texas Water Development Board, Austin, Report 199, February 1976. 156 p.

Descriptors: *Bibliographies, *Hydrologic data, *Documentation, *Abstracts, *Texas, Information retrieval, Publications, Indexing, Reviews, Water resources, Surface waters, Groundwater, Water quality.

This bibliography includes reports. written by the Texas Water Development Board and the U.S. Geological Survey. The reports are related to the development of water resources in Texas. It brings up to date two earlier bibliographies, Texas Water Commission Circulars 63-04 and 64-02, and covers a period from 1888 through August 1974. Annotations are included for each publication unless the title is considered self-explanatory. (Woodard-USGS)
W76-07605

10D. Specialized Information Center Services

SELECTED BIBLIOGRAPHY ON OZONE DISINFECTION,
Canada Centre for Inland Waters, Burlington (Ontario); and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 05D.
W76-07683

WATER DATA COLLECTION AND USE,
Department of the Environment, London (England). Water Data Unit.
For primary bibliographic entry see Field 07C.
W76-07785

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Absorption Cleaning of Organic Effluent Vapours,
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Fluorescent Whitening Agents: Acute Fish Toxicity and Accumulation Studies,
W76-07713 5C

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Accumulation and Loss of Residues of 3-Trifluoromethyl-4-Nitrophenol (TFM) in Fish Muscle Tissue: Laboratory Studies,
W76-08065 5C

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W76-08066 5C

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ACIDIC MINE WATER
Coal Mining Point Source Category, Interim Final Rule Making.
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Iron and Steel Manufacturing Point Source Category Proposed Effluent Guidelines and Standards.
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W76-07708 5D

Study on the Removal of Aromatic Hydrocarbons from Industrial Wastewaters by Means of Activated Carbon (Studio per la rimozione di idrocarburi aromatici da acqua di scarico industriali tramite carboni attivi),
W76-07758 5D

ACTIVATED SLUDGE
Liquid Waste Treatment for the Petroleum Refining Industry (Seikiyu seisei ni okeru haisui shori),
W76-07537 5D

Laboratory Model Study of the Effects on the Aquatic Microflora of Coal-Washing Plant-Generated Waste Waters (Szenmoso-Uzemi Szennyvizek Elovizekre Gyakorolt Hatasnak Laboratoriumi Modellvizsgalata),
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Environmental Law: What is 'Major' in 'Major Federal Action', Minnesota Public Interest Research Group V. Butz, 498 F2d 1314 (8th Cir. 1974).
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Ore Mining and Dressing Point Sources Category, Interim Final Rules.
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National Pollutant Discharge Elimination System,
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Lake Erie International Jetport Model Feasibility Investigation; Report 17-3, Longshore Wave Energy Analyses,
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W76-07606 5A

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W76-07607 5A

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Preliminary Study of Experimental System for Ammonia Removal at South Lake Tahoe Advanced Wastewater Treatment Plant,
W76-07794 5D

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- Ground and surface water hydrology at the Illinois State Water Survey.

- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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- 4 WATER QUANTITY MANAGEMENT AND CONTROL
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 16
AUGUST 15, 1976

W76-08101 -- W76-08750

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear absiractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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ON-SITE RUNOFF DEPLETION AT THREE IMPOUNDMENTS,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 4A.
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COASTAL CIRCULATION AND PHYSICAL OCEANOGRAPHY OF THE SCOTIAN SHELF AND THE GULF OF MAINE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 2L.
W76-08125

SURFACE CIRCULATION PATTERN IN THE GULF OF ST. LAWRENCE,
Quebec Univ., Rimouski. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-08126

SNOWMELT-RUNOFF MODEL FOR STREAM FLOW FORECASTS,
Eidgenoessische Institut fuer Schneeund Lawinenforschung, Davos (Switzerland).
For primary bibliographic entry see Field 2E.
W76-08131

ABOUT THE PROBLEM OF DIRECT RUNOFF DETERMINATION BY SEPARATION OF THE HYDROGRAPH COMPONENTS (K OTAZKE URCENIA PRIMAEHO ODTOKU SEPARACIOU PRIETOKOVYCH VLN),
O. Mendel.
Vodohospodarsky Casopis, Vol. 21, No. 3-4, p 335-350, 1973. 11 fig, 1 tab, 12 ref.

Descriptors: *Hydrographs, *Rainfall-runoff relationships, Base flow, Rainfall, Surface runoff, Groundwater, Storm runoff, Surface-groundwater relationships, Mathematical studies, Flood flow.

Presently there exist many procedures and methods for the separation of surface and groundwater runoff by hydrographs; however, the solutions are applicable only to those localities and geographical conditions for which they were derived. The effect of the runoff depths on the accuracy of the rainfall-runoff relationships has been determined using six methods of surface runoff separation with the rainfall-runoff relationships calculated on the basis of the parametric expression of its conditioning factors. From experimentation, the best conditioning factors were found to be: mean casual rainfall values; duration of the casual rainfall; mean relative air moisture ten days prior to casual rainfall; index of preceding rainfall ten days prior to casual rainfall; and index of the preceding discharges expressed as the initial discharge at the point of rise of the flood hydrograph. The results based on the total coefficient of correlation and all other statistical characteristics show that the closeness of rainfall-runoff increases with the increasing number of the conditioning factors up to the six and then re,aoms almost constant. The differences in the direct runoff determination by separation of the flood hydrograph components according to particular expressions of rainfall-runoff relationships and their statistical characteristics were not substantial and differences between mean values of the direct runoff, its standard deviations, and its total coefficients of correlation for the particular methods of the runoff depth determination were found to be negligible at the one percent significance level. (Sandoski-FIRL)
W76-08238

DERIVATION OF A MODEL RAIN FOR THE DIMENSIONING OF SEWER SYSTEMS (ENTWICKLUNG EINES BERECHNUNGSREGENS FUER DIE BEMESSUNG VON KANALNETZEN),
For primary bibliographic entry see Field 5D.
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VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III - VOLUME 1--DRY WEATHER FLOWS,
Texas Tech Univ., Lubbock. Water Resources Center.
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VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 2, IMPACTS OF DUST STORMS,
Texas Tech Univ., Lubbock. Water Resources Center.
D. E. Bell, B. J. Claborn, R. M. Sweazy, R. H. Ramsey, and D. M. Wells.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 426, $4.50 in paper copy, $2.25 in microfiche. Final Report WRC-75-2, December 1975. 50 p, 1 fig, 10 tab, 28 ref. OWRT B-177-TEX(3).

Descriptors: *Urban hydrology, *Urban runoff, *Suspended solids, Storms, *Model studies, *Texas, Water quality, *Dust, storms.
Identifiers: Lubbock(Tex), Semi-arid areas, Sand storms.

The urban runoff model proposed by Austin to describe both quantity and quality of runoff was applied to a 1499 acre area. The model was then modified to include parameters related to sand/dust storm events. These parameters are: (1) Dust deposited in 10, 20, and 30 day intervals prior to precipitation event. (2) Dust in air during 10, 20, and 30 day intervals prior to precipitation event. The first parameter was based on wind speed observations during dust storms and the second on visibility during dust storms. Both linear and nonlinear relations were investigated. General applicability of the Austin model is questioned, as the predictive ability was somewhat limited. Inclusion of dust/sand parameters did not improve the model. (See also W76-08278).
W76-08279

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 3 - ANALYSIS OF FLOW MODELS,
Texas Tech Univ., Lubbock. Water Resources Center.
B. H. Bailey, R. H. Ramsey, B. J. Claborn, R. M. Sweazy, and D. M. Wells.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 427, $4.00 in paper copy, $2.25 in microfiche. Final Report WRC-75-3, December 1975. 24 p, 3 fig, 3 tab, 5 ref. OWRT B-177-TEX(4).

Descriptors: *Storm runoff, *Flow rates, Flow, *Model studies, *Texas, *Correlation analysis, Cities, Water quality, *Urban runoff, Watershed management, Peak discharge, Urbanization.
Identifiers: *Lubbock(Tex), Flow model comparison, Semi-arid areas, *Urban watersheds.

Runoff events from a 1499 acre urban watershed in Lubbock, Texas were monitored over a nine month period from September 1974 to May 1975. The observed peak flows and runoff volumes were compared to the outputs generated from 4 runoff models which used the precipitation records and watershed characteristics as inputs. Criteria for selecting the models used in the analysis were the time, money, and effort required for implementation. The following models were used: Rational; Viessman, Keating, and Srinivasa; Viessman and Miller, and the British Road Research Laboratory (RRL). For the study data, the Viessman, Keating, and Srinivasa Method yielded a correlation of .91 to best predict the total runoff from a precipitation event. The RRL Method had a correlation Co-efficient of .45 - the best in predicting the peak rates. By using observed flow volumes and peak rates of flow as reference values, the outputs from the various models were compared to determine how conservative the models were in predicting peak rates of flow and runoff volumes. The index numbers obtained for the volumes of runoff were: 4.51 for the Viessman-Miller Method; 2.83 for Viessman, Keating, and Srinivasa Method and 5.86 for the RRL Method. The index numbers obtained for the peak rates of flow were 12.82 for the rational method; 3.24 for the Viessman, Keating, and Srinivasa Method, and .86 for the RRL Method. (See also W76-08278)
W76-08280

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 4 - PROJECT SUMMARY,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-08281

INVESTIGATION OF USE OF SPACE DATA IN WATERSHED HYDROLOGY,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 4A.
W76-08326

THE DEVELOPMENT OF A SNOW ROUTINE FOR THE HBV-2 MODEL,
Swedish Meteorological and Hydrological Inst., Stockholm.
For primary bibliographic entry see Field 2C.
W76-08338

HOW MUCH PRECIPITATION GOES TO INFILTRATION DURING A STORM PERIOD,
Karnataka Regional Engineering College, Surathal (India). Dept. of Mechanics and Hydraulics.
T. Babu Rao, G. Ranganna, and I. V. Nayak.
Nordic Hydrology, Vol. 6, No. 2, p 93-113, 1975. 14 fig, 1 tab, 15 ref, 1 append.

Descriptors: *Precipitation(Atmospheric), *Infiltration, *Storms, Storm water, Basins, Interception, Evaporation, Transpiration, Surface runoff, Winds, Land use, Soil moisture, Solar radiation, Watersheds(Basins).
Identifiers: Storm characteristics, Abstractions, Multi-correlations.

Storm characteristics and condition of a basin at the beginning of a storm were developed for a basin, based on a detailed investigation of factors influencing infiltration and functional relationships among the abstractions during a storm period. Graphical multiple correlations were also obtained for estimating the abstractions. Basin characteristics like area, slope and soil characteristics were treated as time-invariant. When abstractions during a storm period due to other causes were negligible, the sum of the abstractions could be approximated to infiltration during the storm period. For 10 basins with 60 storms, graphical multiple correlations were prepared for estimating abstractions. These correlations were verified using a different set of 112 storms in addition to the 60 storms used in the calibration phase. The results were discussed and five conclusions were made. (Roberts-ISWS)
W76-08339

WATER TEMPERATURE VARIATIONS WITHIN A MAJOR RIVER SYSTEM,
University of Strathclyde, Glasgow (Scotland). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-08340

WATER RESOURCES OF THE WORLD, SELECTED STATISTICS.
Geraghty and Miller, inc., Port Washington, N.Y.
For primary bibliographic entry see Field 7C.
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URBAN HYDROLOGY FOR SMALL WATERSHEDS.
Soil Conservation Service, Upper Darby, Pa. Engineering Div.
For primary bibliographic entry see Field 4D.
W76-08509

EFFECTS OF HYDROLOGIC REGIME ON MAGNITUDE AND FREQUENCY OF DOMINANT DISCHARGE,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-08514

THE GROUNDWATER OUTCROP-EROSION MODEL; EVOLUTION OF THE STREAM NETWORK IN THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Instituut voor Aardwetenschappen.
J. J. DeVries.
Journal of Hydrology, Vol. 29, No. 1/2, p 43-50, March 1976. 3 fig, 6 ref.

Descriptors: *Drainage patterns(Geologic), *Drainage density, *Erosion, *Base flow, *Hydrology, *Model studies, Geomorphology, Geologic control, Pleistocene epoch, Glacial drift, Groundwater, Surface runoff, Discharge(Water), Topography, Percolation, Infiltration, Permeability, Channeling, Ponding, Storage, Water table, Hydraulic gradient, Darcys law.
Identifiers: *Netherlands, *Groundwater outcrop-erosion model(GOEM), *Outcrops, Stream development, Stream order, Conceptual model, Bifurcation ratio.

The stream network in the higher, Pleistocene part of The Netherlands is genetically coupled with groundwater discharge systems of various extents. Streams of a given order can be explained as outcrops of groundwater flow systems of corresponding order. The drainage system is controlled by the precipitation surplus (climate), the resistance of the subsurface to groundwater flow (geology) as well as the previous relief and the incision depth (topography). This concept was defined as the groundwater outcrop-erosion model (GOEM). Stream nets can be synthesized theoretically from this model using geologic, geomorphologic and climatic data based on groundwater flow formulas and Horton's law on stream order vs. stream density. (Visocky-ISWS)
W76-08515

AN OPTIMIZATION TECHNIQUE ADAPTED TO USDAHL-74 REVISED MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
G. H. Comer, and W. H. Henson.
Water Resources Bulletin, Vol. 12, No. 1, p 139-146, February 1976. 2 tab, 9 ref.

Descriptors: *Agricultural watersheds, *Hydrologic systems, *Computer models, *Optimization, Soil surveys, Hydrology, Model studies, Soil moisture, Methodology, Watershed management.
Identifiers: *Search optimization routine, *Input parameters, System sensitivity.

USDAHL-74, revised model of watershed hydrology, treats a watershed as a distributed system. The input parameters are derived from available soil survey information, cropping patterns, topography, and general climatic conditions. To determine optimum parameters, a direct search optimization routine has been added to the model. The results indicated a more closely matching model output to observed data and illustrated the sensitivities of the parameters. The study showed that the solutions derived based on different objective functions were not radically different. The sensitivities of the model output to various parameter changes could be used to better understand the behavior of the model under various circumstances. (Singh-ISWS)
W76-08523

THE USE OF LIKELIHOOD FUNCTIONS TO FIT CONCEPTUAL MODELS WITH MORE THAN ONE DEPENDENT VARIABLE,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2G.
W76-08729

IMPLEMENTATION OF HYDROLOGIC MODELS AT GODDARD SPACE FLIGHT CENTER.
IBM Space Systems Center, Huntsville, Ala.
Available from the National Technical Information Service, Springfield, Va 22161 as N75 17766, $3.50 in paper copy, $2.25 in microfiche. Final Report, IBM No. 74W-00323, December 31, 1974. 7 p, 8 ref. NASA NAS5-20597.

Descriptors: *Model studies, *Simulation analysis, *Computer models, *Maryland, River basins, Remote sensing, Watersheds(Basins), Hydrologic data.
Identifiers: *Moisture-accounting flow, *Monocasy River(Md), *Patuxent River(Md), Stanford watershed model.

Two major watershed simulation models were implemented on the computer system at NASA Goddard Space Flight Center, Greenbelt, Maryland. The two hydrologic models - NASA-IBM model and the National Weather Service River Forecast System (NWSRFS)- had pleaviously been developed. Project activity consisted of: (1) acquisition of historical and physiographic data for two Maryland river basins (Monocasy River above Jug Bridge and Patuxent River near Laurel); (2) calibration of the NASA-IBM model and the NWSRFS to simulate the Patuxent River and Monocasy River basins, respectively; (3) implementation of both models on the computer system at Goddard Space Flight Center; and (4) instruction of Goddard personnel in model operation. Documents describing model concepts, operation and application were listed in references. In operation, the models implemented a moisture-accounting flow, distributing input (precipitation and snowmelt) among storages (vegetative interception, soil moisture, groundwater, snowpack, channel flow, overland flow), losses (evapotranspiration) and output (streamflow from the basin mouth where the stream gage was located). The models produced tabulations and plots of simulated and observed streamflow as well as statistical analyses and summaries. (Roberts-ISWS)
W76-08745

2B. Precipitation

ON A THERMAL LAG IN THE NORTH ATLANTIC OCEAN DURING A CLIMATIC CHANGE,
Ocean-Atmosphere Research Inst., Cambridge, Mass.
For primary bibliographic entry see Field 2L.
W76-08127

PARTICLE VAPORIZER,
Department of the Navy, Washington, D.C.
For primary bibliographic entry see Field 3B.
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VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 2, IMPACTS OF DUST STORMS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08279

EXAMINATION OF THE CONCEPT AND USE OF THE STANDARD PROJECT FLOOD,
Meta Systems, Inc., Cambridge, Mass.
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LASER APPLICATIONS TO ATMOSPHERIC SCIENCES - A BIBLIOGRAPHY,
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DESIGN OF AN EXPERIMENT TO SUPPRESS HAIL IN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
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HOW MUCH PRECIPITATION GOES TO INFILTRATION DURING A STORM PERIOD,
Karnataka Regional Engineering College, Surathal (India). Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 2A.
W76-08339

THE ESTIMATION OF LOCAL RAINFALL BY SAMPLE GAUGING,
D. J. Hatch.
Weather, Vol. 31, No. 3, p 79-83, March 1976. 6 fig, 1 tab, 5 ref.

Descriptors: *Rainfall, *Networks, *Gaging, Precipitation gages, Data processing, Data collections, Measurement, Estimating, Precipitation(Atmospheric), Network design, Rainfall disposition, Meteorology.
Identifiers: *Error.

Although techniques are being developed to estimate the distribution and quantity of local rainfall by radar, ground-level networks of raingages remain the usual method of analysis. Such networks almost invariably represent a sample of recording points which are too scattered and uneven to reflect accurately the local distribution of rainfall upon which estimates of mean daily rainfall amount must be based. Networks of gages suffer both systematic and random errors, the former being related to the positioning of gages and the latter to the number of gages in the network. A method was outlined to illustrate how progressively increasing the numbers of gages in a network can alter the apparent distribution of rainfall and affect estimates of the mean fall, under different synoptic conditions and rainfall types. It seems that estimates of mean rainfall are reasonably accurate once gage density reaches one gageper 100 sq km but that distribution requires densities of at least one gage per 20 sq km to reflect local effects, and that considerably denser networks would be required for confidence in the distribution of intense local falls. (Sims - ISWS)
W76-08348

RAIN GAUGE,
J. Baer.

U. S. Patent No. 3,943,762, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1125, March 16, 1976.

Descriptors: *Patents, *Rain gages, *Instrumentation, Rainwater, Rainfall, Rainfall deposition, Electronic equipment.
Identifiers: Cummulative rainfall.

A rain gauge is comprised of a counter and a pivoted bistable receiver having two compartments and which is adapted to pivot between first and second limit positions. A collector operates to collect the rainwater and directs it into one or the other of the compartments depending upon where the receiver is positioned. When the operative receiver compartment accumulates a predetermined amount of water, for example water representative of one-tenth of an inch or rainfall, it pivots to the other limit position, placing the other compartment in the operative position, dumping the contents of the first compartment and actuating a counter which registers the increment of rainfall. The actuation of the counter is accomplished by applying an electrical pulse to the counter, the pulse being generated by the pivotal movement of the receiver. The pulse is generated by a sensor cooperating with and sensing receiver movement such as reed switch responsive over the middle range of its movement to a magnet carried by the receiver. Adjustable counterweight means are provided to adjust the balance of the receiver to enable accurate calibration of the gauge. (Sinha-OEIS)
W76-08397

EASTERN LAKE ONTARIO PRECIPITATION NETWORK,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
S. J. Bolsenga, and D. C. Norton.
NOAA TM ERL GLERL-5; GLERL Contribution No. 47; November 1975. 52 p, 7 fig, 36 tab, 1 ref, 6 append.

Descriptors: *Precipitation(Atmospheric), *Effective precipitation, *Precipitation intensity, Precipitation gages, Rainfall, Meteorology, Meteorological data, Hydrology, Hydrologic data, *Lake Ontario, Great Lakes, New York, *Networks.
Identifiers: Precipitation data, Precipitation measurement.

A six gage precipitation network was operated for a 5-year period in the eastern portion of the Lake Ontario basin. Descriptions of the instrumentation, site locations, and data reduction procedures and a complete listing of the data are provided. (NOAA)
W76-08412

A COMPARISON OF MANUALLY DIGITIZED RADAR DATA AND OBSERVED COOL SEASON PRECIPITATION OVER THE SOUTHERN APPALACHIANS,
National Weather Service, Fort Worth, Tex. Southern Region.
H. T. May.
NOAA TM NWS-84, Jan. 1976 10 p, 4 fig, 3 tab, 5 ref.

Descriptors: *Precipitation(Atmospheric), *Rain, *Sleet, *Snowfall, *Climatology, Meteorology, *Precipitation gages, *Radar, Mountains, *Appalachian Mountain Region, Estimating.
Identifiers: Observed precipitation, Precipitation estimates, Manually digitized radar(MDR).

A limited evaluation of observed precipitation and precipitation estimates utilizing manually digitized radar (MDR) values over the southern Appalachians and adjacent plains (foothills) was undertaken for the period mid-November 1973 through mid February 1974. Factors such as beam filling, range, precipitation tops, freezing level, terrain effects, frequency distribution of MDR data, and radar estimates of precipitation over mountain and plain are examined. (NOAA)
W76-08414

APPLICATION OF THE NATIONAL WEATHER SERVICE FLASH-FLOOD PROGRAM IN THE WESTERN REGION,
National Weather Service Salt Lake City, Utah. Western Region.
For primary bibliographic entry see Field 4A.
W76-08415

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, Colo.
J. H. Wagner.
Report FR-807-40, Final Report, Phase I, February 11, 1975, 65 p, 16 fig, 1 tab, 2 append. Prepared for Bureau of Reclamation, Division of Atmospheric Water Resources Management, Denver, Colorado. BuRec 14-06-D-7551

Descriptors: Data collections, Precipitation(Atmospheric), *Telemetry, Data transmission, *Networks, *Meteorological data, *Data processing, *On-site data collections, *Remote sensing, Data storage and retrieval, *Precipitation gages, Gaging stations.
Identifiers: Microprocessors, Satellite data collections, Aircraft data collections, Digital sensors, Digital data recording, *Automatic data collection, ERTS data systems.

This report describes the development of two techniques for automatic collection of data from remote precipitation gages. Both techniques utilize a digital precipitation gage developed as a part of this program. The ERTS-RAIN concept is designed for a network of gages operating within a 12 mile radius of an ERTS Data Central. The Airborne-RAIN concept is designed for data collection from a network of gages operating over an area of several thousand square miles. Experimental systems were developed and tested in order to demonstrate the feasibility of both concepts. The ERTS-RAIN network provides very fine data resolution both in time and coverage area. The digital tape record at the Remote Data Central enables data to be transferred directly into a computer with a minimum of intermediate handling. The Airborne-RAIN network is most efficient when it is providing data over a wide coverage area with samples taken at a relatively low rate (30-or 60-minute intervals). Specific recommendations for implementation of prototype networks for evaluating the operational aspects of the network are included. (Bureau of Reclamation)
W76-08694

THE SIGNIFICANCE AND VARIATION OF ATMOSPHERIC NUTRIENT INPUTS IN A SMALL CATCHMENT SYSTEM,
Sheffield Univ. (England), Department of Geography.
For primary bibliographic entry see Field 5A.
W76-08728

RAINFALL AND FLOODS IN INDIA DURING 1974 SOUTHWEST MONSOON PERIOD,
Meteorological Office, New Delhi (India).
S. D. S. Abbi, M. R. Nagasubramanian, and P. K. Datta Roy.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 26, No. 4, p 435-441, October 1975. 1 fig, 3 tab.

Descriptors: *Rainfall, *Floods, *Monsoons, *Asia, Data collections, Climatic data, Depth-area curves, Flood data, Meteorological data, Weather data, Precipitation(Atmospheric), Meteorology, Climatology.
Identifiers: *India, 1974 rainfall, Southwest monsoon.

The rainfall during the 1974 southwest monsoon period was normal or above normal over northeast India, south Peninsula, Jammu and Kashmir, West Madhya Pradesh, Konkan and Goa and Madhya Maharashtra and below normal over rest of the country. The rainfall deficiencies over the deficit states were, however, between 20 and 40% except in Gujarat State where it remained scanty (-60% or less) throughout the period. The characteristic features of this year's monsoon were (1) the monsoon activity continued over most parts of the country beyond 30 September and the rainfall deficiencies in most of the deficit states were made up subsequently to some extent; (2) all time record rainfall of 58.0 cm occurred on 5 July over Bombay city (Colaba) and 450.0 cm for the month of September 1974 over Cherapunji; (3) a severe cyclonic storm crossed West Bengal coast near Contai on the afternoon of 15 August 1974, which is quite unusual for this time of the season; and (4) unprecedented floods ravaged south Kanara district of Karnataka and many districts of Kerala during 25 to 31 July 1974. (Sims-ISWS)
W76-08732

EXTREME RAINFALL STUDIES OF THE BRAHMANI, THE BURHABALANG, THE RUSHIKULYA AND THE SUBARNAREKHA RIVER CATCHMENTS,
Meteorological Office, New Delhi (India).
T. G. Changraney, S. K. Dube, and S. D. S. Abbi.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 26, No. 4, p 511-517, October 1975. 3 fig, 6 tab, 11 ref.

Descriptors: *Rainfall, *Excessive precipitation, *Probable maximum precipitation, Watersheds(Basins), Rivers, Precipitation excess, Depth-area curves, Depth-area-duration analysis, Precipitation(Atmospheric), Storms, Monsoons, Climatic data, Weather data, Meteorology, Climatology.
Identifiers: *India.

The rivers of Orissa region are prone to frequent floods during the southwest monsoon season, primarily because of the region lies in the normal track of monsoon depressions that originate in the Bay of Bengal and cross Orissa coast in course of their westerly to northwesterly direction of movement. With a view to estimating their maximum flood potential, it is necessary to find the maximum average rainstorm depth that has actually been realized in various catchments and to estimate the maximum rainfall that can probably occur in these catchments. For this purpose, the present study has been made and comparative appraisal made of the extreme storms rainfall depths thus arrived at. The present study was confined to the Brahmani, the Burhabalang, the Rushikulya and the Subarnarekha river catchments. (Sims-ISWS)
W76-08733

2C. Snow, Ice, and Frost

SNOWMELT-RUNOFF MODEL FOR STREAM FLOW FORECASTS,
Eidgenoessische Institut fuer Schneeund Lawinenforschung, Davos (Switzerland).
For primary bibliographic entry see Field 2E.
W76-08131

THE STUDY OF FRESH-WATER LAKE ICE USING MULTIPLEXED IMAGING RADAR,
Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
M. L. Bryan, and R. W. Larson.
Journal of Glaciology, Vol. 14, No. 72, p 445-457, 1975. 7 fig, 19 ref. NASA NAS 3-18239.

Descriptors: *Lake ice, *Radar, Great Lakes, *Lake Superior, Aircraft, *Remote sensing, Instrumentation, Iced lakes, Ice, Electrical properties, Microwaves, *Michigan.
Identifiers: Whitefish Bay(Mich), Straits of Mackinac(Mich).

The study of ice in the upper Great Lakes, both from the operational and the scientific points of view, is receiving continued attention. Quantitative and qualitative field work is being conducted to provide the needed background for accurate interpretation of remotely sensed data. The data under discussion in this paper were obtained by a side-looking multiplexed airborne radar (SLAR) supplemented with ground-truth data. Because of its ability to penetrate adverse weather, radar is an especially important instrument for monitoring ice in the upper Great Lakes. It has previously been shown that imaging radars can provide maps of ice cover in these areas. However, questions concerning both the nature of the surfaces reflecting radar energy and the interpretation of the radar imagery continually arise. The analysis of ice in Whitefish Bay (Lake Superior) indicated that the combination of the ice/water interface and the ice/air interface is the major contributor to the radar backscatter as seen on the imagery. At these frequencies the ice has a very low relative dielectric permittivity (less than 3.0) and a low loss tangent. Thus, this ice is somewhat transparent to the energy used by the imaging SLAR system. The ice types studied included newly formed black ice, pancake ice, and frozen and consolidated pack and brash ice. (Sims-ISWS)
W76-08138

EVALUATION OF ERTS DATA FOR CERTAIN HYDROLOGICAL USES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 7C.
W76-08147

ARCHING OF FRAGMENTED ICE COVERS,
Cold Regions Research and Engineering Lab., Hanover, N.H. Applied Research Branch.
D. J. Calkins, and G. D. Ashton.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A009 499, $3.50 in paper copy, $2.25 in microfiche. Special Report 222, April 1975. 16 p, 16 fig, 2 tab, 1 ref.

Descriptors: *Ice cover, *Rivers, *Model studies, *Hydraulic models, Flumes, Laboratory tests, Ice jams, Ice, Navigation, Structures, Hydraulics.
Identifiers: Ice floes, Ice blocks, *Arching, River ice.

A study of arching by fragmented ice floes across a gap in a surface obstacle was reported. The study included several series of experiments in a hydraulic flume in which simulated ice was released upstream of the surface obstacle at controlled rates and the occurrence or non-occurrence of the formation of a stable arch was observed. The threshold of arching was found to correlate well as a function of the supply rate of surface area of ice, the exit ice surface discharge at the gap, and the ratio of individual floe size to gap dimension. In a series of corollary experiments an arch, once formed, was subjected to a disturbance in the form of a vertical rod traversed longitudinally through the accumulation in the upstream direction. The quantity of ice released and the rate of release prior to another arch re-forming was determined. (Sims-ISWS)
W76-08149

ALTERNATIVE METHODS OF ESTIMATING SNOW WATER PARAMETERS,
Idaho Univ., Kimberly. Water Resources Research Inst.
D. L. Reese, H. F. Mayland, and C. E. Brockway.
Water Resources Research, Vol. 9, No. 5, p 1433-1439, October, 1973. 2 fig, 3 tab, 5 ref.

Descriptors: *Analytical techniques, *Snowmelt, Snow, Water equivalent, Estimating, Regression analysis, Idaho, Mathematical studies, Probability.
Identifiers: Recurrence, Snow water parameters.

A recurrence analysis technique using probability and contingency relationships of snow depth, water equivalent, and snow density is presented. Three methods of estimating snow water parameters at a given site by recurrence and the presently used regression techniques are based on the value from the previous month at the site; the value from a reference site and the month to previous month contingency parameter of the reference course. The recurrence technique, Pearson type 3, was tested on three central Idaho snow courses and was most useful when the third method was used to estimate snow depth and either of the first two methods was used to estimate the water equivalent. Correlation of estimated values to measured values indicated equal reliability of recurrence and regression analysis when the three methods were used. The recurrence technique can be used successfully in estimating snow water parameters and their probability of occurrence. (Sandoski-FIRL)
W76-08259

EVALUATION OF GLACIER MASS BALANCE BY OBSERVING VARIATIONS IN TRANSIENT SNOWLINE POSITIONS,
Norwegian Water Resources and Electricity Board, Oslo.
G. Ostrem.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-26469, $3.50 in paper copy, $2.25 in microfiche. Report SR No. 376, Fall 1974. 9 p, 3 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Glaciers, *Snow cover, Satellites(Artificial), On-site investigations, Snowmelt, Melt water, Water resources, Rivers, Hydrology, Glaciology.
Identifiers: *Transient snowlines, *Norway, *ERTS, Mass balance.

During this experiment only a very limited number of scenes were obtained, mainly due to weather conditions (mountain areas in Southwestern Norway are often covered by clouds of various kinds). However, the transient snowline on five outlet glaciers from the Jostedalsbreen ice-cap in Southwestern Norway could be determined from ERTS image No. 1336-102060, when bands MSS 5, 6 and 7 were combined in an additive color viewer. The snowline was situated at a very low altitude at the time of imagery (June 24, 1973) indicating that glacier melt was behind normal schedule, a fact that has a hydrologic bearing: one could expect less melt water in the streams. The idea to use ERTS imagery in snowline determinations proved realistic and relatively easy to apply in practice. The method will be useful to estimate the glaciers' mass balance for large areas, provided some ground truth observations are made. Images from the end of the melt season are vital in this work, because it can be shown that a linear relationship exists between a glacier's mass balance and the height of the transient snowline at the end of the melt season. On an operational basis, satellite images obtained in the fall will provide valuable information on glaciers' mass balance, and thus also hydrologic data for various users, e.g. for water power engineers. To obtain full benefit from this new technique, it is necessary to have some background data of glaciological nature. (Sims-ISWS)
W76-08322

THE DEVELOPMENT OF A SNOW ROUTINE FOR THE HBV-2 MODEL,
Swedish Meteorological and Hydrological Inst., Stockholm.
S. Bergstrom.
Nordic Hydrology, Vol. 6, No. 2, p 73-92, 1975. 1 fig, 2 tab, 6 ref.

Descriptors: *Rainfall-runoff relationships, *Model studies, Snowmelt, Water, Parametric hydrology, Snow cover, Trees, Forests, On-site investigations, Forest watersheds, Snow, Precipitation(Atmospheric), Temperature, Runoff.
Identifiers: *Snow routine, *Sweden, Snow accumulation, Error function, Snow routing.

The development of a snow routine for the HBV-rainfall-runoff model was described. Experience from field investigation that have contributed t the work were briefly discussed. In the snow routine, snow accumulation and snowmelt were simulated using daily totals of precipitation and mea daily temperatures. The application of the mode to a 2178 sq km forested basin in central Swede was shown. A critical study of the interaction an effects of the parameters was carried ou (Roberts-ISWS)
W76-08338

BEHAVIOUR OF OIL UNDER CANADIAN CLI MATIC CONDITIONS. PART 1. OIL O WATER UNDER ICE-FORMING CONDITIONS
Department of the Environment, Ottaw (Ontario). Inland Waters Directorate; and Depar ment of the Environment, Ottawa (Ontario Water Quality Branch.
For primary bibliographic entry see Field 5B.
W76-08365

THE STATE OF WATER IN PLANT TISSUE AT NEGATIVE TEMPERATURES UNDE NATURAL CONDITIONS, (IN RUSSIAN),
Kirov Agric. Inst., Kirov, USSR.
For primary bibliographic entry see Field 2I.
W76-08368

SNOW-REGULATING ROLE OF THE FOREST BELTS IN THE STEPPES OF TH KRASNOYARSK KRAI, (IN RUSSIAN),
T. I. Alifanova.
Izv Sib Otd Akad Nauk SSSR Ser Biol Nauk. 1, 42-47, 1975. (Engl. Summ.).

Descriptors: *Snowpacks, *Grasslands, Regula tion, Forests.
Identifiers: *Forest belts, Steppes *USSR(Krasnoyarski Krai).

The total range of the forest belt (including Scotc pine and black poplar) influence on the snow dis tribution is as much as 30 H (multiples of tre height) in this region (Russian SFSR, USSR), widens to 50 H and more with agricultura techniques in areas with weakened protection Snow keeping in the open field on the surface o plowland is 25%, in the fields which are protecte by belts of blown construction it is 65%, in th fields of transulate construction, 81% and in th fields of dense construction, 55%: with the agricu tural techniques applied it is 94%, 108% and 93% respectively. Water supply in the protected fields surpassing water supply in the open fields is: at th belts of blown construction 215 m3, with stubbl 325 m3; with transulate construction 255 m3 an 450 m3, respectively; with dense construction it 80 m3 and 235 m3/ha of sown field, respectively. Copyright 1976, Biological Abstracts, Inc.
W76-08383

EFFECT OF CRUDE OIL ON POPULATION OF BACTERIA AND ALGAE IN ARTIFICIA PONDS SUBJECT TO WINTER WEATHER AN ICE FORMATION,
For primary bibliographic entry see Field 5C.
W76-08453

ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. M. Anderson, H. L. McKim, L. W. Gatto, R. K. Haugen, and W. K. Crowder.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-21767, $6.00 in paper copy, $2.25 in microfiche. Final Report, February 26, 1974. 112 p, 56 fig, 7 tab, 59 ref. NASA S-70253-AG.

Descriptors: *Remote sensing, *Cold regions, *Snow cover, *Estuaries, *Alaska, *Arctic, Subarctic, Satellites(Artificial), Permafrost, Rivers, Ice, Bays, Water circulation, Deposition(Sediments), Data processing, Instrumentation.
Identifiers: *ERTS, *Cook Inlet(Alaska).

ERTS-1 imagery provides a means of distinguishing and monitoring estuarine surface water circulation patterns and changes in the relative sediment load of discharging rivers on a regional basis. Physiognomic landscape features were used as geologic and vegetative indicators in preparation of a surficial geology, vegetation, and permafrost map at a scale of 1:1 million using ERTS-1 band 5 imagery. The detail available from ERTS-1 imagery at 1:1 million scale compared favorably with the detail available on U.S. Geological Survey Miscellaneous Geologic Investigation Maps at a scale of 1:250,000. Physical boundaries mapped from ERTS-1 imagery in combination with ground truth obtained from existing small scale maps and other sources resulted in improved and more detailed maps of permafrost terrain and vegetation for the same area. Comparison of ERTS-1 and Mariner imagery has revealed that the thermokarst depressions found on the Alaskan North Slope, polygonal patterns on the Yukon River Delta, and the alas topography in the Yakutian region of Siberia are possible analogs to some Martian terrain features. Snowpack cover within a research watershed has been analyzed and compared to ground data. Large river icings along the proposed Alaska pipeline route from Prudhoe Bay to the Brooks Range have been monitored. Sea ice deformation and drift northeast of Point Barrow, Alaska have been measured during a four day period in March and shore-fast ice accumulation and ablation along the west coast of Alaska have been mapped for the spring and early summer seasons. (Sims-ISWS)
W76-08510

OCEANOGRAPHIC CONDITIONS DURING 1973 IN RUSSEL FJORD, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W76-08525

THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W76-08537

THE NITROGEN BALANCE OF ARCTIC TUNDRA: PATHWAYS, RATES, AND ENVIRONMENTAL IMPLICATIONS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W76-08678

2D. Evaporation and Transpiration

ON-SITE RUNOFF DEPLETION AT THREE IMPOUNDMENTS,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 4A.
W76-08122

A MODEL FOR ESTIMATING ACTUAL EVAPOTRANSPIRATION FROM POTENTIAL EVAPOTRANSPIRATION,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark).
K. J. Kristensen, and S. E. Jensen.
Nordic Hydrology, Vol. 6, No. 3, p 170-188, 1975. 10 fig, 2 tab, 15 ref.

Descriptors: *Evapotranspiration, *Model studies, *Vegetation, Barley, Grasses, Sugar beets, Soil water, Climatology, Runoff, Root zone, Water supply, Rainfall, Evaporimeters, Measurement, Estimating.
Identifiers: *Actual evapotranspiration, *Potential evapotranspiration, *Vegetation density, Fodder, Soil water content, Climatic demand.

A model for calculating the daily actual evapotranspiration based on the potential one was presented. The potential evapotranspiration was reduced according to vegetation density, water content in the root zone, and the rainfall distribution. The model was tested by comparing measured (EAm) and calculated (EAc) evapotranspirations from barley, fodder sugar beets, and grass over a four-year period. The measured and calculated values agreed within 10%. The model also yielded information on soil water content and runoff from the root zone. In the model it was assumed that runoff did not occur before the soil was resaturated to field capacity after drying out. If this requirement was not fulfilled (due to steep slopes, impermeable soils, some cracking soils), the model failed to work. For most soils, the model could be used, and yielded information on the day-by day actual evaporation, change in soil water content, and runoff. (Roberts-ISWS)
W76-08132

WATER USE BY SALTCEDAR AS MEASURED BY THE WATER BUDGET METHOD,
Geological Survey, Lubbock, Tex.
T. E. A. van Hylckama.
Available from Supt. of Documents, GPO, Wash. D. C. 20402, price $1.30. Professional Paper 491-E, 1974. 30 p, 35 fig, 17 tab, 34 ref.

Descriptors: *Evapotranspiration, *Hydrologic budget, Vegetation, Analytical techniques, *Water loss, Climatology, Environmental effects, Hydrologic cycle, Riparian plants, Salinity, Soil moisture, *Water utilization, *Arizona.
Identifiers: *Saltcedar water use, *Water budget method.

Water use by saltcedar (Tamarix pentandra) was studied from 1961 through 1967 near Buckeye, Ariz. The test site, in the flood plain of the Gila River, was surrounded by a kilometre-wide dense strip of saltcedar thickets. Areas to the north and south of the strip were mainly desert and a few cotton fields. The test site growing season lasts 8 to 9 months, the humidity is low, winds are strong, summer temperatures at the site often reach 50 deg C, and evapotranspiration rates are among the highest in the United States. Evapotranspiration rates and quantities were observed in six plastic-lined evapotranspirometers (tanks) with 81 square-metre surfaces. Analyses were made on the effects of depth to groundwater in the tanks, of salinity of soil moisture, and of vegetation density. Rates of water use from bare and vegetated soil were observed in five smaller tanks. When the depth to groundwater, or water table, was 1.5 m (metres) the average water use was about 215 cm/yr (centimetres per year); when the water table was 2.1 m, the use diminished to about 150 cm/yr; and when the water table was 2.7 m, the yearly water use was less than 100 cm/yr. Water use varies greatly with salinity of the soil moisture. (Woodard-USGS)
W76-08573

RELATION BETWEEN PLANT TRANSPIRATION AND METABOLISM, (IN RUSSIAN),
Tashkent Agricultural Academy (USSR).
I. I. Razmaev.
Uzb Biol Zh. 19(1), p 18-21, 1975.

Descriptors: *Plant tissues, Corn(Field), *Transpiration, *Metabolism, *Water uptake, *Equations, Mathematical studies.
Identifiers: *Cell sap activity.

Fractionation of water in the cells of plant (corn) tissues into free, osmotically and colloidally bound was insufficient for characterizing the water regime. It was necessary to introduce another parameter of the cell sap activity, namely, Wk, the kinetic energy directly affecting proteins and complex compounds or proteins with other substances and under the effect of which the submolecular organization of the protoplast changes. An equation for calculating Wk is proposed. The possibility of using transpiration as an integral index characterizing the state of a plant was substantiated.--Copyright 1976, Biological Abstracts, Inc.
W76-08583

GREAT PLAINS EVAPOTRANSPIRATION BY A RESISTANCE MODEL USING REMOTELY SENSED THERMAL IMAGERY,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
E. T. Kanemasu.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 740, $6.75 in paper copy, $2.25 in microfiche. Kansas Water Resources Research Inst. Dec. 1975. Projected Conducted in cooperation with Agri. Met. Sec., Dept. of Agri. Eng. Univ. of Nebr., Lincoln, Nebraska. OWRT B-038-KAN(1). 14-31-0001-4147.

Descriptors: *Lysimeters, *Evapotranspiration, *Great Plains, Remote sensing, Model studies, Water balance, Estimating measurement, Heat resistance, Boundary layers, Instrumentation.
Identifiers: *Canopy temperature, *Thermal scanner, *Boundary layer resistance, Atmospheric attenuation.

Because evapotranspiration is usually a major component in the water balance, a method for estimating evapotranspiration of a large region is of major importance. Resistance forms of the energy balance equation require the measurement of a boundary layer resistance to heat or mass transport,corp and air temperature, net radiation,vapor pressure, and soil heat flux. The exact form of the equation may differ depending on the availability of input data and the specific assumptions used by the investigators. Four separate equations/techniques were tested against lysimetric and/or Bowen ratio-energy balance estimates of evapotranspiration to develop empirical equations under varying conditions. Resistance forms of the energy balance, in which data could be supplied, in part, by remote sensing, were also evaluated. Thermal scanner measurements were evaluated for estimating canopy temperature. Accurate extrapolation of scanner data to ground level is essential for estimating evapotranspiration. Atmospheric attenuation can produce errors in absolute temperatures of 2 to 6 C. (See W76-08586 thru W76-08591).
W76-08585

RESISTANCE-ENERGY BALANCE METHOD FOR PREDICTING EVAPOTRANSPIRATION: DETERMINATION OF BOUNDARY LAYER RESISTANCE AND EVALUATION OF ERROR EFFECTS,
S. B. Verma, N. J. Rosenberg, B. L. Blad, and M. W. Baradas.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p. I-1 thru I-29.

Descriptors: *Evapotranspiration, *Model studies, Measurement, *Sorghum, *Millet, *Advection, Lysimeters, Energy balance,

Micrometeorology, Microclimates, Heat transfer, Latent heat, Crop response.
Identifiers: *Error analysis, Turbulent transfer, Sensible heat transfer, Latent heat transfer, *Boundary layer resistance.

A resistance model of evapotranspiration (ET) requiring measurement of boundary layer resistance, crop and air temperature, net radiation and soil heat flux was tested over sorghum and millet grown at Mead and Mitchell, Nebraska. Boundary layer resistance was estimated from friction velocity measurements used in a stability-corrected aerodynamic method. Friction velocity was computed by means of the Deacon-Swinbank approach. Evapotranspiration rates estimated by the resistance model compared well with results of lysimetric and energy balance measurements, on both a short-period and a daily basis. An error analysis was made to evaluate the relative influence of errors in measurement of the constituent input parameters. This analysis, in conjunction with field measurement, indicates that the resistance model evapotranspiration estimates are quite sensitive to errors in crop temperature measurement, especially in non-advective conditions, but are less strongly affected by errors in the estimation of boundary layer resistance. Boundary layer resistance for the sorghum and millet crops at varying stages of growth are presented as functions of windspeed. (See also W76-08585.)
W76-08586

AN EVALUATION OF A RESISTANCE FORM OF THE ENERGY BALANCE TO ESTIMATE EVAPOTRANSPIRATION,
J. L. Heilman, and E. T. Kanemasu.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p. II-1 thru II-22.

Descriptors: *Evapotranspiration, *Model studies, Boundary layers, Heat resistance, Latent heat, Heat transfer, Lysimeters, Sorghum, Soybeans, Crop response.
Identifiers: *Boundary layer resistance, Diffusion resistance, Momentum transport, Heat transport, Canopy temperature.

An evapotranspiration model that uses the diffusion resistance to heat transport (rH) in the turbulent boundary layer was evaluated for soybean (Glycine max (L.) cv. Williams) and sorghum (Sorghum bicolor (L.) cv. Pioneer 846). Model estimates of latent heat flux (LE) were within 4% and 15% of lysimetric measurements for soybean and sorghum, respectively. When using resistance to momentum (rD), estimates of LE for soybean were 25% greater, but for sorghum only 10% greater than when using resistance to heat transport (rH). (See also W76-08585)
W76-08587

RESISTANCE-MASS TRANSFER METHOD FOR ESTIMATING EVAPOTRANSPIRATION: COMPARISON WITH LYSIMETRIC MEASUREMENTS IN IRRIGATED SORGHUM,
M. W. Baradas, N. J. Rosenberg, B. L. Blad, and S. B. Verma.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p III-1 thru III-23.

Descriptors: *Evapotranspiration, *Sorghum, Moisture content, *Soil moisture, *Model studies, Crop response, Advection, Microclimates, Micrometeorology, Stomata, Canopy, Cover crops.
Identifiers: Stomatal resistance, Canopy resistance.

A resistance-mass transfer model of evapotranspiration (LE) was compared with lysimetric measurements in a field of irrigated sorghum (Sorghum bicolor Moench,CV. 'RS 633'). The model is an analogue of Ohm's law where the gradient of vapor pressure from leaf to air is the driving force (voltage) acting against the series resistances to diffusion exerted by the boundary layer and the plant canopy. Latent heat flux is the analog of current flow in Ohm's law. The crop canopy vapor pressure is assumed to be the saturation vapor pressure at the measured leaf temperature. For these tests boundary layer resistance values were provided by the method of Verma et.al. (1976). Canopy resistance, rc, was calculated from measured values of stomatal resistance and leaf area index. Alternatively, values were synthesized by solving the model with rc as the residual term (rc res) using lysimetric measurements of LE. These latter values were used to calculate the regression of canopy resistance on irradiance (rc reg). The model, when measured canopy resistances were used, provided estimates of LE to within 10% of the lysimetrically measured LE on a daily basis, although hourly values occasionally gave irregular agreement. With rc reg values, derived from one set of data and applied to an independent set, agreement between measured and modeled LE was also with + 10 % on a daily basis. Model estimates of LE using rc reg gave better agreement than those made with measured rc on an hourly basis. The model can be used effectively in sorghum when moisture supply is not limiting. An experimental effort is required to develop rc values as joint functions of irradiance and soil moisture potential in order to expand the model's usefulness to rainfed conditions or to any situations where soil moisture conditions restrict the rate of evapotranspiration. (See also W76-08585)
W76-08588

COMPARISON OF A MODIFIED BROWN-ROSENBERG RESISTANCE MODEL WITH OTHER EVAPOTRANSPIRATION ESTIMATION METHODS: TESTS IN AN IRRIGATED SORGHUM FIELD,
S. B. Verma, and N. J. Rosenberg.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p. IV-1 thru IV-19.

Descriptors: *Evapotranspiration, *Model studies, Estimating, *Sorghum, Irrigation, Crop response, *Radiation, Air temperature, Nebraska.
Identifiers: Net radiation, Air vapor pressure, Canopy resistance, Stomatal resistance, Penman method, Potential evapotranspiration, Resistance models.

The Brown-Rosenberg (1973) resistance model for estimating evapotranspiration was modified and tested in an irrigated sorghum field at Mead, Nebraska. The model requires inputs of net radiation, air temperature and vapor pressure, canopy and boundary layer resistance. The first three of these parameters were measured. The canopy resistance was estimated from a functional dependency on irradiance. The boundary layer resistance was estimated from a functional dependence on windspeed. The model prediction agreed with direct lysimetric and Bowen ratio-energy balance measurements of latent heat flux to within 10% on both an hourly and daily basis. The Brown-Rosenberg model is useful when neither direct nor remotely sensed canopy temperature data are available and when the separate impacts of the environmental and crop parameters mentioned above on the evapotranspiration process are to be evaluated. (See also W76-08585)
W76-08589

CANOPY TEMPERATURE MEASUREMENT OF SORGHUM AND MILLET WITH LEAF THERMOCOUPLE AND INFRARED THERMOMETER TECHNIQUES,
B. L. Blad, N. J. Rosenberg, E. T. Kanemasu, and J. L. Heilman.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p. V-1 thru V-34.

Descriptors: *Evapotranspiration, Remote sensing, *Radiation, *Thermal radiation, Sorghum, Nebraska, Kansas, *Infrared radiation.
Identifiers: *Crop temperature, Radiation thermometer, Thermal radiometer, Millet.

Crop temperature of sorghum at Mead, Nebraska and Manhattan, Kansas and of millet at Scottsbluff, Nebraska was measured by IR thermometry and with attached leaf thermocouples. In both crops agreement between the temperature measured by the IR thermometer (TIR) and that measured by the thermocouple (TTC) was better for millet than for sorghum. Improvement in the agreement was noted as crop cover increased. Except at Manhattan, TIR and TTC agreed sufficiently well, with a few exceptions, during the daytime to provide reliable estimates of evapotranspiration (ET) using crop temperature based ET models. At night, in most cases, TTC was nearer the crop temperature expected from air temperature gradient measurements. The evidence in favor of more accurate estimation of crop temperature by TTC was not totally convincing, however. Results of this study point out a need to study several crop, soil and instrument factors which may affect the accuracy of the crop temperature measurements. (See also W76-08585)
W76-08590

THERMAL SCANNER MEASUREMENTS OF CROP TEMPERATURES TO ESTIMATE EVAPOTRANSPIRATION,
J. L. Heilman, E. T. Kanemasu, N. J. Rosenberg, and B. L. Blad.
In: Kansas Water Resources Research Institute, Manhattan, Contribution No. 172, December 1975, p. VI-1 thru VI-17.

Descriptors: *Evapotranspiration, *Soybeans, *Sorghum, Temperature, Measurement, Remote sensing, :Infrared radiation, Crop response.
Identifiers: Emissivity, Infrared thermometry, Aerosols, Precipitable water, Atmospheric attenuation, Boundary-layer resistance, *Millet, *Crop temperature.

Temperatures of soybean (Glycine max L.), sorghum (Sorghum bicolor L.), and millet (Panicum miliaceum L.), measured with a thermal scanner flown at altitudes of 610 and 1220 m, were used in a resistance form of the energy-balance equation to estimate evapotranspiration (ET). Atmospheric attenuation produced errors of 2 to 6 C in the scanner measurements. Errors from neglecting emissivity corrections were less than 0.5 C. A correction procedure relating temperature error to atmospheric precipitable water was applied to the scanner measurements. Estimates of ET using the corrected temperatures differed from lysimetric measurements by -0.40 to 0.17 ly/min. It was found that accurately extrapolating scanner measurements to ground level was essential for estimating ET. (See also W76-08585).
W76-08591

2E. Streamflow and Runoff

SNOWMELT-RUNOFF MODEL FOR STREAM FLOW FORECASTS,
Eidgenoessische Institut fuer Schneeund Lawinenforschung, Davos (Switzerland).
J. Martinec.
Nordic Hydrology, Vol. 6, No. 3, p 145-154, 1975. 5 fig, 1 tab, 6 ref.

Descriptors: *Snowmelt, *Runoff, *Streamflow, *Model studies, *Forecasting, Meteorology, Rainfall-runoff relationships, Snow, HYdology, Melt water, Ablation, Temperature.
Identifiers: *Runoff model, *Degree-day factor, Snow accumulation, Discharge computations, Snowmelt-runoff computation.

A snowmelt-runoff model, based on the development of rainfall-runoff models, was described. It was based on taking into account the variability of the degree-day factor, recession coefficient, and snow coverage. It can be adapted to heterogenous conditions of snow accumulation and temperature in mountainous basins. Meltwater depth was calculated by using the number of degree-days obtained as the average of positive temperatures observed over a 24 hour period. Due to varying conditions in the snowpack and the fact that the air is not the only source of heat, the degree-day factor varied over a wide range. The snow density appeared to be a useful index for estimation degree-day ratios in the absence of direct measurements. The accuracy of short-term forecasts depended on the knowledge of the future trend of temperature. Seasonal forecasts of the runoff pattern in a snowmelt season could be carried out if the expected temperature conditions were given. (Roberts-ISWS)
W76-08131

ULTRASONIC RIVER FLOW MEASUREMENT,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 7B.
W76-08241

WATER TEMPERATURE VARIATIONS WITHIN A MAJOR RIVER SYSTEM,
University of Strathclyde, Glasgow (Scotland). Dept. of Geography.
K. Smith.
Nordic Hydrology, Vol. 6, No. 3, p 155-169, 1975. 6 fig, 8 tab, 15 ref.

Descriptors: *Water temperature, *Streamflow, *River systems, Air temperature, Snowmelt, Electric power, Ecology, Time, Rivers, On-site data collections, Discharge(Water), Hydrology, Storms.
Identifiers: *Tees River(England), *England, *Temperature variations, River temperature, Storm rainfall, Multiple regression.

The relationships between river water temperature, air temperature, and streamflow were measured continuously for one year at four sites along the main stream of the river Tees in northern England. River temperatures correlated closely with equivalent air temperatures at each site, but emphasis was placed on the effects of hydrological factors on water temperature variations within the 818 sq km basin. The range of water temperature fluctuations was shown to increase upstream, and the highest river maxima were also recorded in the upper reaches of the river, owing to the relatively low volume of discharge. On a shorter time scale, streamflow was also found to exert an important influence on river temperature during snowmelt and peak flow events arising from storm rainfall. A multiple regression analysis indicated that air temperature and streamflow together accounted for up to 85% of the variation of daily maximum and minimum river temperatures in summer. (Roberts-ISWS)
W76-08340

DIMENSIONLESS SOLUTION OF DAM-BREAK FLOOD WAVES,
Patras Univ. (Greece). School of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-08343

SIMULATION OF HYDRAULIC PROCESSES IN OPEN CHANNELS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-08344

APPLICATION OF THE NATIONAL WEATHER SERVICE FLASH-FLOOD PROGRAM IN THE WESTERN REGION,
National Weather Service Salt Lake City, Utah. Western Region.
For primary bibliographic entry see Field 4A.
W76-08415

CHANNEL FLOW OVER PERMEABLE BEDS OF GRADED SPHERES,
Humphreys (Howard) and Sons, Reading (England).
For primary bibliographic entry see Field 8B.
W76-08511

EFFECTS OF HYDROLOGIC REGIME ON MAGNITUDE AND FREQUENCY OF DOMINANT DISCHARGE,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
G. Pickup, and R. F. Warner.
Journal of Hydrology, Vol. 29, No. 1/2, p 51-75, March 1976. 8 fig, 2 tab, 42 ref.

Descriptors: *Discharge(Water), *Hydrologic aspects, *Australia, Frequency curves, Bank storage, Bed load, Annual flood, Geomorphology, Hydrology, Annual peak discharge, Flow, Sediment transport.
Identifiers: *Hydrologic regime, *Dominant discharge, *Cumberland basin(Australia),Bedload transport, Annual series, Fluvial geomorphology.

Estimates of three flows categorized as dominant discharge were derived for Cumberland Basin streams: the most effective discharge with regard to bed-load transport, the 1.58-year flood, and the natural bankfull discharge. The most effective discharge was found to have a return period of 1.15-1.40 years on the annual series but was much smaller than the 1.58 year flood. Bankfull discharge return periods were mainly within the range 4-10 years on the annual series. Observations of channel changes in Crawfords Creek indicated that the characteristics of the bed are related to flows similar to the most effective discharge but these flows do not erode the banks. Instead, bank erosion is related to much larger floods. It was suggested that many Cumberland Basin streams are not incised but that their capacity is determined by large floods. Two groups of flows, it was concluded, determine channel characteristics: the small flows which transport moot of the bed load and the large flows which determine channel capacity. Streamflow is dominated by two populations of runoff events, while channel bed material contains little fine to medium sand. Together, these two factors modify the typical process balance involved in channel and floodplain formation. (Roberts-ISWS)
W76-08514

A RECONSIDERATION OF THE FIERING TWO-STATION MODEL,
Birmingham Univ. (England). Dept. of Mathematical Statistics.
For primary bibliographic entry see Field 4A.
W76-08519

NONPARAMETRIC STATISTICAL ANALYSIS OF ANNUAL PEAK FLOW DATA FROM A RECENTLY URBANIZED WATERSHED,
Mount Rogers Planning District Commission, Marion, Va.
For primary bibliographic entry see Field 4C.
W76-08522

INTERSTATION CORRELATION OF PEAK-FLOW ESTIMATES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-08555

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 1. SURFACE WATER RECORDS--VOLUME 2: NORTHERN GREAT BASIN AND CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-08556

HYDROLOGY OF THE THREE SINKHOLE BASINS IN SOUTHWESTERN SEMINOLE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-08572

PRELIMINARY HYDROLOGIC DESIGN OF SMALL FLOOD DETENTION RESERVOIRS,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 8B.
W76-08731

RAINFALL AND FLOODS IN INDIA DURING 1974 SOUTHWEST MONSOON PERIOD,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2B.
W76-08732

COMPLEX WIDTH-DISCHARGE RELATIONS IN NATURAL RIVER SECTIONS,
Lanchester Polytechnic, Coventry (England).
K. S. Richards.
Geological Society of America Bulletin, Vol. 87, No. 2, p 199-206, February 1976. 5 fig, 2 tab, 27 ref.

Descriptors: *Rivers, *Hydraulic properties, *River flow, Channels, Channel flow, Width, Discharge(Water), Flow, Geomorphology, Analytical techniques, Hydraulics.
Identifiers: *Width-discharge relations, Hydraulic geometry.

Hydraulic geometry exponents may be used to discriminate between types of river section. This was illustrated by a discriminant analysis of data from riffle and pool sections. The complexity of most natural channels, however, precludes the use of a single index to cover a wide range of discharges. This was demonstrated in an analysis of several width-discharge curves defined up to, but not beyond, bankfull stage. (Sims-ISWS)
W76-08735

COMPUTATION OF TIDAL FLOW IN WELL-MIXED ESTUARIES,
Washington Univ., Seattle. Dept. of Aeronautics; and Washington Univ., Seattle. Dept. of Mathematics.
For primary bibliographic entry see Field 2L.
W76-08741

SUPPRESSION OF WAVES IN SLOTTED-WALLED CHANNEL,
Trinity Coll., Cambridge (England).
For primary bibliographic entry see Field 8B.
W76-08742

DISSIPATION OF TURBULENT ENERGY IN A NATURAL CHANNEL,
Gidrometeorologicheskii Institut, Odessa (USSR).
For primary bibliographic entry see Field 8B.
W76-08744

2F. Groundwater

GROUND WATER FLOW NO LONGER A MYSTERY,
National Water Well Association, Columbus, Ohio.
J. H. Lehr, and W. A. Pettyjohn.

Journal of Environmental Health, Vol. 38, No. 4, p. 242-250. Jan/Feb 1976.

Descriptors: *Ground water flow, *Groundwater recharge, *Groundwater potential, *Water table, *Wells, *Water pollution sources, *Model studies, Aquifer, Surface-groundwater relationship, Path of pollutants.

Ground water occurs in rock formation that have interconnections for the water to pass through. Water usually moves only a few feet per year, though locally it may flow rapidly. Ground water is a very significant source of supply and is generally of high quality but there is a close relatioship between surface and ground water, so that management of one must include the other. Pollution from the land and from streams finds its way into ground water where it may remain for many years before entering wells in the area or contaminating other surface water supplies. Experiments are explained which demonstrate some principle ground water flow. A model with a porous consolidated mixture of sand and epoxy resin between plexiglass simulates a rock formation; ink is introduced to show flow. One demonstration shows how a pump changes flow wihin the aquifer. As soon as the pump is turned on, each particle of water is realigned toward the pump and eventually a new equilibrium is established which depends on the new set of boundary conditions which affect the flow. Another demonstration shows how a pump draws down the water table and creates a cone of depression. To obtain optimum benefits from an aquifer the system must be jointly controlled and operated. A third model shows the effect of a stream on the hydrologic gradient of the aquifer. In effect the stream acts as an open horizontal well which has a lower head and therefore draws groundwater toward it, even water lower than it. Placement of septic tanks, wells, waste disposal sites, etc., all affect quality of water. Proper management and strict enforcing of guidelines is necessary to alleviate problems in these areas. (Smith-North Carolina)
W76-08114

AN INTEGRATED FINITE DIFFERENCE METHOD FOR ANALYZING FLUID FLOW IN POROUS MEDIA,
California Univ., Berkeley. Dept. of Civil Engineering.
T. N. Narasimhan, and P. A. Witherspoon.
Water Resources Research, Vol. 12, No. 1, p 57-64, February 1976. 10 fig, 30 ref.

Descriptors: *Numerical analysis, *Groundwater movement, *Porous media, Heat transfer, Conduction, *Finite element analysis, Flow, Equations, Potential flow, Theis equation, Fracture permeability, Mathematical studies, Computers, Stability.
Identifiers: *Integrated finite difference method, *Finite difference gradients, Explicit-implicit iterative scheme, Galerkin method, Integral formulations, Discretization, Point source flow.

The theoretical basis for the integrated finite difference method (IFDM) was presented to describe a powerful numerical technique for solving problems of groundwater flow in porous media. The method combines the advantages of an integral formulation with the simplicity of finite difference gradients and is very convenient for handling multidimensional heterogeneous systems composed of isotropic materials. Three illustrative problems were solved to demonstrate that two- and three-dimensional problems are handled with equal ease. Comparison of IFDM with the well-known finite element method (FEM) indicated that both are conceptually similar and differ mainly in the procedure adopted for measuring spatial gradients. The IFDM includes a simple criterion for local stability and an efficient explicit-implicit iterative scheme for marching in the time domain. If such a scheme can be incorporated in a new version of FEM, it should be possible to develop an improved numerical technique that combines the inherent advantages of both methods. (Visocky - ISWS)
W76-08123

DETERMINING AQUIFER TRANSMISSIVITY BY MEANS OF WELL RESPONSE TESTS: THE UNDERDAMPED CASE,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
G. van der Kamp.
Water Resources Research, Vol. 12, No. 1, p 71-77, February 1976. 2 fig, 3 tab, 7 ref.

Descriptors: *Aquifer testing, *Transmissivity, *Theoretical analysis, Aquifer characteristics, Water levels, Well filters, Equilibrium, Equations, Water level fluctuations, Well casings, Aquifers, Artesian aquifers, Artesian heads, On-site data collections.
Identifiers: *Well response test, *Slug test, *Oscillations, *Damping, Overdamping, Underdamping, Inertial effects, Effect length, Effective radius.

Well response tests, often referred to as slug tests, provide a relatively simple and inexpensive method for estimating aquifer transmissivity. An approximate theory was developed for the problem of underdamped well response where the inertia of the water in the well column results in force-free oscillation of the water level in the well. This type of response is often encountered in conjunction with highly permeable aquifers. The theory is applicable for nearly all such cases except those where the oscillation is very quickly damped out. Theoretical predictions compared well with empirical results and indicated that the theory may be used to obtain estimates of aquifer transmissivity. This theory for the underdamped case together with existing theory for overdamped response makes it possible to obtain an estimate of transmissivity from well response tests for almost any aquifer. (Visocky - ISWS)
W76-08124

ESTIMATION BY DIGITAL COMPUTER OF THE DRAWDOWN CAUSED BY GROUNDWATER WITHDRAWAL,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4B.
W76-08140

METHOD FOR LOCATING AND EVALUATING GEOTHERMAL SOURCES OF ENERGY BY SENSING ELECTROSTATIC VOLTAGE GRADIENTS,
For primary bibliographic entry see Field 4B.
W76-08204

TRANSIENT FREE SURFACE FLOW TO A WELL: AN ANALYSIS OF THEORETICAL SOLUTIONS,
Centro di Ricerca IBM di Venezia (Italy).
G. Gambolati.
Water Resources Research, Vol. 12, No. 1, p 27-39, February 1976. 12 fig, 1 tab, 59 ref.

Descriptors: *Unsteady flow, *Water table aquifers, *Equations, Storage coefficient, Specific yield, Water wells, Drawdown, Groundwater, Stress, Pressure head, Theis equation, Dupuit-Forchheimer theory.
Identifiers: *Delayed yield, *Linearization, *Delay index, Elastic storage, Vertical flow, Radial flow, Well storage.

Results based on linearization and on the delayed yield concept provide the most theoretical advancements to date for solving the differential equations of transient free surface flow to a fully penetrating gravity well. If the elastic storage coef ficient is markedly less than the specific yield, ver tical flow is predominant in a cylindrical zone o the water table between two regions where flow i essentially radial and controlled by two differen Theis equations. The true physical alph (reciprocal of Boulton's delay index) is found t vary almost linearly with the reciprocal of th distance from the pumped well and becomes constant at some distance (equal to twice th aquifer thickness if the medium is isotropic). A empirical delay index is also found by equatin Boulton's solution and the linearized averag drawdown. Its expression enables the use of th delayed yield solution in computing average draw downs with an accuracy equal to that of th linearization approach. the present solutions as sumed small water table drawdowns and an in finite aquifer. (Visocky-ISWS)
W76-08333

FLOW INTERFERENCE EFFECTS AT FRAC TURE INTERSECTIONS,
Leeds, Hill, and Jewett, Inc., San Francisco Calif.
C. R. Wilson, and P. A. Witherspoon.
Water Resources Research, Vol. 12, No. 1, p 102 104, February 1976. 4 fig, 1 ref.

Descriptors: *Groundwater movement, *Fractur permeability, *Model studies, Hydraulic models Flow, Laminar flow, Fractures(Geologic), Cracks Rocks, Hydrology, Hydraulics, Laboratory tests Hydrogeology, Subsurface waters, Groundwater.
Identifiers: *Fracture intersections, Flow inter ference.

A series of laboratory experiments were con ducted to determine the magnitude of laminar flow interference effects at fracture intersections. Cir cular conduits were used in these experiments t maintain strict dimensional tolerance, and the in tersection head loss, if expressed in terms o equivalent length of straight conduit, should be th same order of magnitude for a circular pipe as fo a parallel plate fracture model. The results in dicated that interference effects at intersection are negligibly small in most fracture systems whe flow is in the laminar regime. (Sims-ISWS)
W76-08335

SOLUTION FOR RADIAL-FLOW WITH NON LINEAR ADSORPTION,
Amoco Production Co., Tulsa, Okla.
For primary bibliographic entry see Field 5B.
W76-08345

HYDROGEOLOGY OF THE SOUTH FORK OF LONG ISLAND, NEW YORK,
Wisconsin Univ. Oshkosh. Dept. of Geology.
C. W. Fetter, Jr.
Geological Society of America Bulletin, Vol. 87 No. 3, p 401-406, March 1976. 8 fig, 4 tab, 8 ref.

Descriptors: *Hydrogeology, *Groundwater *Hydrologic budget, *Saline water-freshwater interfaces, *New York, *Atlantic coastal plain, Safe yield, Unconsolidated sediments, Saline water, Saline water intrusion, On-site investigations, Hydraulic conductivity, Transmissivity, Specific yield, Storage coefficient, Groundwater recharge, Artificial recharge, Septic tanks, Pumping, Observation wells, Water table, Aquifers.
Identifiers: *Long Island(NY), *Coastal aquifers, Raritan formation, Magothy formation.

The South Fork of Long Island, New York, is underlain by unconsolidated Pleistocene and Cretaceous sediments resting on crystalline bedrock. A two-layered aquifer system contains fresh groundwater with saline groundwater in the deeper strata. The average horizontal hydraulic conductivity of the upper aquifer is 49 m/day and of the lower aquifer is 25 m/day. The average annual precipitation of 1.14 m is the only natural

source of fresh water. After consumptive losses the precipitation provides about 1.85 x 10 to the 8th power cu m/yr to recharge the water table. Discharge of fresh groundwater occurs primarily as undersea outflow to the ocean at the perimeter of the area. The safe yield of the area is estimated to be 91,500 cu m/day. (Visocky-ISWS)
W76-08347

RADIAL DISPERSION THROUGH ADSORBING POROUS MEDIA,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 5B.
W76-08512

TRANSIENT AQUIFER FLOWS BY CHARACTERISTICS METHOD,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
E. B. Wylie.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 12001, p 293-305, March 1976. 9 fig, 1 tab, 22 ref, 2 append. NSF GI-34771.

Descriptors: *Unsteady flow, *Numerical analysis, *Groundwater movement, *Aquifers, Computer models, Discharge(Water), Drawdown, Mathematical studies, Equations, Time, Wells, Computers, Theis equation, Transmissivity, Storage coefficient, Hydraulics, Groundwater.
Identifiers: *Method of characteristics, *Leaky aquifers, Radial flow, Computer time, Inertia multiplier, Transformation, Time step, Stability analysis.

A numerical model was presented to analyze nonsteady radial flow in a finite or infinite leaky aquifer system. An equation of motion alteration, which involves the introduction of an inertia multiplier, converted the standard equations of transient groundwater flow to a form suitable for efficient solution by the method of characteristics. The result was a numerical method that should be attractively competitive in computer time usage with other numerical procedures currently in use. The equations were presented and the procedure developed for axisymmetrical flow. Several examples were used to expose the influence of the size of the distance intervals and the size of the inertia multiplier on the accuracy of the numerical process. Either constant or time-variable discharge or drawdown rates may be used as boundary conditions in infinite or bounded radial aquifer systems. Radially varying aquifer properties and leakage may also be treated. (Visocky-ISWS)
W76-08513

THE GROUNDWATER OUTCROP-EROSION MODEL; EVOLUTION OF THE STREAM NETWORK IN THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Instituut voor Aardwetenschappen.
For primary bibliographic entry see Field 2A.
W76-08515

IMPROVED IMAGE-WELL TECHNIQUE FOR AQUIFER ANALYSIS,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-08517

DYNAMIC RESPONSE OF AQUIFER SYSTEMS TO LOCALIZED RECHARGE,
Chile Univ., Santiago. Centro de Recursos Hidraulicos.
G. Cabrera, and M. A. Marino.
Water Resources Bulletin, Vol. 12, No. 1, p 49-63, February 1976. 7 fig, 18 ref.

Descriptors: *Recharge, *Streams, *Aquifers, *Finite element analysis, *Flow system, *Model studies, Analytical techniques, Base flow, Hydraulics, Numerical analysis, *Computer programs, Surface-groundwater relationships.
Identifiers: Boundary-value problems, Variational approach.

The response of stream-unconfined aquifer systems to localized recharge was investigated by means of a two-dimensional finite element model. A variational approach was used in conjunction with the finite element method to solve the ground-water flow equation. Linear approximated triangular elements were used to calculate the hydraulic head distribution in the flow region. The Crank-Nicholson centered scheme of numerical integration was employed to approximate the time derivative in the flow equation. A computer program was developed to calculate the hydraulic head distribution in the flow region. Solutions provided by the finite element model should prove useful in the evaluation of quantitative and qualitative changes in aquifer systems due to natural or artificial recharge. In addition, they should prove useful in the study of irrigation and drainage problems. (Singh-ISWS)
W76-08520

DESIGN OF GROUND-WATER LEVEL OBSERVATION NETWORK.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-08563

AMINO ACIDS AND GASES IN SOME SPRINGS AND AN OIL FIELD IN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W76-08568

ARTIFICIAL-RECHARGE EXPERIMENTS IN THE ALLUVIAL AQUIFER SOUTH OF FOUNTAIN, EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-08571

EXIT OF GROUND WATERS ON DRAINAGE BOUNDARIES,
Ebasco Services Inc., New York.
B. S. Browzin.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 102, No. GT2, Proceedings Paper 11909, p 159-173, February 1976. 4 fig, 6 tab, 15 ref, 5 append.

Descriptors: *Groundwater movement, *Flow, *Discharge(Water), Engineering structures, Hydraulic structures, Dams, Seepage, Reservoir leakage, Groundwater, Analytical techniques, Embankments, Earth dams, Slopes, Equations.
Identifiers: Exit point.

A known analytical solution provides the location of the exit point of the free surface of groundwaters as a function of the slope angle and the reduced discharge in a form of a finite integral. This integral was evaluated numerically and a substitute polynomial equation provided to determine the function. Based on the exact position of the exit point, a new discharge formula free from any preliminary assumptions was derived. It covers the range of slope angles from near 0 to 180 degrees for infinitely long aquifers. It was found that the same formula is applicable to certain finite lengths. Applicability of the function for the location of the exit point and the discharge formula for earth dams was considered. It was explained that a hydraulically equivalent rectangle, which substitute the upstream prism, must have the width of the base substantially smaller than that used in older theories. (Gibb-ISWS)
W76-08750

2G. Water In Soils

NUTRIENT AND SEDIMENT CHARACTERISTICS OF TILE EFFLUENT IN OHIO,
Ohio State Univ. Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08121

CALCULATING THE UNSATURATED HYDRAULIC CONDUCTIVITY AND DIFFUSIVITY,
Mississippi State Univ., State College. Dept. of Agronomy.
F. D. Whisler.
Soil Science Society of America Journal, Vol. 40, No. 1, p 150-151, January-February 1976. 2 fig, 7 ref.

Descriptors: *Unsaturated flow, *Hydraulic conductivity, *Diffusivity, *Moisture content, *Pressure head, Numerical analysis, Equations, Soil water movement, Soil water, Graphical analysis, Methodology, Soil properties.
Identifiers: Moisture characteristic curves.

The methods of R. D. Jackson and R. H. Brooks and A. T. Corey for calculating the unsaturated hydraulic conductivity from water content-pressure head relationships were compared. The corresponding diffusivity relationships can also be evaluated either by a numerical differentiation of the water content-pressure head curves plus the conductivity, or by direct calculation from the differentiation of the Brooks and Corey function. Both methods gave approximately the same results for the hydraulic conductivity relationships. The diffusivity values calculated from the Brooks and Corey functions were lower than those calculated by the numerical method for a Grenada silt loam soil. Both diffusivity relationships gave essentially the same beta values for the W. R. Gardner and M. S. Mayhugh diffusivity-water content function. (Visocky - ISWS)
W76-08142

DISTRIBUTION OF PLUTONIUM IN SOIL PARTICLE SIZE FRACTIONS OF LIQUID EFFLUENT-RECEIVING AREAS AT LOS ALAMOS,
Los Alamos Science Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W76-08160

OXYGEN RELATIONSHIPS IN A SOIL TREATED WITH SEWAGE EFFLUENT,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W76-08231

A COMPARATIVE STUDY OF THE EFFECT OF QUALITIES OF IRRIGATION WATER ON DIFFERENT SOILS,
Udaipur Univ. (India). Coll. of Agriculture.
For primary bibliographic entry see Field 3C.
W76-08301

THE EFFECT OF FOREST STANDS ON THE WATER CONTENT OF ROCKS OF THE LOESS COVER IN THE WESTERN REGIONS OF THE NORTHERN BLACK SEA AREA, (IN UKRANIAN),
USSR Akademiya Nauk URSR, Kiev. Instytut Geologichnykh Nauk.
For primary bibliographic entry see Field 4A.
W76-08303

SALT AND WATER BALANCE IN IMPERIAL VALLEY, CALIFORNIA,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 3C.

W76-08331

INFILTRATION ANALYSIS AND PERTURBATION METHODS 1. ABSORPTION WITH EXPONENTIAL DIFFUSIVITY,
City Coll., New York. Dept. of Mathematics.
D. K. Babu.
Water Resources Research, Vol. 12, No. 1, p 89-93, February 1976. 1 fig, 25 ref.

Descriptors: *Soil moisture, *Infiltration, *Model studies, Mathematical models, Equations, Analytical techniques, Subsurface waters, Diffusion, Soil temperature, Soil physical properties, *Absorption, Soils, *Diffusivity.

Simple perturbation methods were employed to analyze the horizontal absorption of moisture in unsaturated soils. The special case treated assumed the diffusivity to be an exponential function of the concentration and the concentration at the boundaries to be constant. The solution emerged as an explicitly determined power series in the Boltzmann variable. The resulting profiles were compared with some others found in the existing literature. A discussion about the relevance and advantages of this type of analysis formed the concluding part of the paper. (Sims-ISWS)
W76-08334

EFFECTS OF GRAZING ON INFILTRATION RATES IN WASTE WATER SPRAY FIELDS,
West Virginia Univ., Morgantown. Div. of Plant Sciences.
For primary bibliographic entry see Field 5E.
W76-08352

THERMAL PROPERTIES OF FINE TEXTURED MOLLISOLS UNDER VARYING MOISTURE CONDITIONS,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India).
R. P. Tripathi, and B. P. Ghildyal.
J Indian Soc Soil Sci. 22(2), p 103-108, 1974.

Descriptors: Soils, *Soil temperature, Soil water movement, *Moisture content, Specific heat, *Thermal properties, Thermal conductivity, Diffusivity, Physical properties, *Clay loam, *Loam, Clays.
Identifiers: *Mollisols, Phoolbagh clay loam, Beni silty clay loam, Haldi loam.

The specific heat of Phoolbagh clay loam, Beni silty clay loam and Haldi loam was 0.231, 0.224 and 0.207 Cal g -1 C-1, respectively, as determined by the radiation calorimeter. Thermal conductivity of the 3 soils ranged from 6.6x10-4 to 6.54 x 10-3 Cal cm-1 sec- -1 C-1 when the water content changed from 0.065-0.434 cm3 cm-3 respectively. In all the soils the thermal conductivity increased with percent saturation rapidly up to about 50% pore saturation. The rate of increase, however, decreased for pore saturation greater than 50%. The rate of increase in the thermal conductivity of Beni silty clay loam was higher than Haldi loam and Phoolbagh clay loam. Similarly, the rate of increase of thermal diffusivity (a) was higher in Beni silty clay loam than in Haldi loam and Phoolbagh clay loam. The maximum value of a occurred around 50% of pore saturation.--Copyright 1975, Biological Abstracts, Inc.
W76-08364

PORE SIZE DISTRIBUTION OF COMPACTED SOILS AFTER CRITICAL REGION DRYING,
Purdue Univ., Lafayette, Ind. Joint Highway Research Project.
R. N. Bhasin.
Report JHRP-75-3, March 1975. 220 p.

Descriptors: *Soil compaction, Soil water, Drying, Water vapor, *Porosity, Moisture content, Soil moisture, Analytical techniques.
Identifiers: *Pore size distribution(Soils), Mercury intrusion technique.

--Major objective was to develop an improved insight into the soil compaction process in terms of the pore size distribution resulting from variations of the soil compaction variables, and of the changes in this parameter arising as a result of exposing compacted soils to soaking under a moderate surcharge, thus partly simulating service conditions. The mercury intrusion technique was used to obtain pore size distributions on dried specimens of a number of naturally occurring soils, compacted at various water contents. The wet specimens were dried by transforming soil water to water vapor in the critical region without effecting change in the total porosity and probably in the size distribution of pores. It was shown that different soils compacted to a given percentage compaction, but to different total porosities. Soils compacted at Standard Proctor optimum moisture contents to different total porosities had pore size distributions similar to each other. (WES)
W76-08416

PROPERTIES OF EXPANSIVE CLAY SOILS; REPORT 2, A NUMERICAL PROCEDURE FOR PREDICTING HEAVE WITH TIME,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W76-08420

ARTIFICIALLY SIMULATING THE GEOLOGICAL HISTORY OF CLAY,
Imperial Coll. of Science and Technology, London (England).
For primary bibliographic entry see Field 8D.
W76-08421

INFILTRATION INTO INCREASINGLY PERMEABLE SOILS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
H. Bouwer.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR1, Proceedings Paper 11959, p 127-136, March 1976. 3 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Drainage, *Infiltration, *Infiltration rates, *Permeability, Soil properties, Soils, Digital computers, Irrigation, Hydraulic conductivity, Equations, Wetting, Depth.
Identifiers: *Infiltration capacity, *Green-Ampt equation, *Tabular procedures, Infiltration equation, Permeable soils.

A tabular procedure, based on the Green-Ampt equation, was developed to calculate infiltration into soil that becomes more permeable with depth. The procedure is simple and the results compared favorably with those obtained with a digital computer. The procedure supplements a previous paper which showed how the Green-Ampt equation could be used to calculate infiltration into soil becoming less permeable with depth. The Green-Ampt equation is emerging as a useful, simple, yet theoretically sound infiltration equation. The extension of the equation to soils where the permeability changes with depth should enhance its utility in practical applications, where soils are seldom, if ever, uniform. (Roberts-ISWS)
W76-08516

FUNDAMENTAL ASPECTS OF EROSION OF COHESIVE SOILS,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-08540

DEEP TILLAGE OF GRADED-FURROW-IRRIGATED PULLMAN CLAY LOAM,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 3F.
W76-08543

RATE OF CHLORIDE AND WATER MOVEMENT IN SOUTHERN CALIFORNIA SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
R. J. Tullock, N. T. Coleman, and P. F. Pratt.
Journal of Environmental Quality, Vol. 4, No. 1, 127-131, January-March 1975. 3 fig, 3 tab, 25 ref.

Descriptors: *Chlorides, *Soils, *Soil investigations, *Soil water movement, *California, Columns.
Identifiers: *Chloride movement, Anion movement.

Column experiments in the laboratory showed a increase of 2 to 25% in the relative rate of chlorid movement in soils to water when the movement c water was calculated on a total pore-volume basi The increase was explained as a result of anion ex clusion next to the surfaces of negatively charge soil colloids. The relative rate of flow wa decreased when the moisture retained by the a dry soils was deleted from the total pore solution For soils containing sufficient clay to result in cation exchange capacity greater than 1 meg/100g, an equation was developed relating th fraction of the pore solution in equilibrium wit anions to the cation exchange capacity. Calculate transit times for anion movement from the soil su face to ground waters should include a correctio for the volume of exclusion. (Gaylord Skogerboe Colorado State)
W76-08545

NITRATE REDUCTION AND ASSOCIATED MICROBIAL POPULATIONS IN A PONDEROSA HANFORD SANDY LOAM,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5G.
W76-08546

WATERSHED SOIL DETACHMENT AND TRANSPORTATION FACTORS,
Agricultural Research Service, Morris, Minn.
For primary bibliographic entry see Field 2J.
W76-08551

INTERACTION OF PLUTONIUM WITH COMPLEXING SUBSTANCES IN SOILS AND NATURAL WATERS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W76-08605

PROCEDURE FOR PLUTONIUM ANALYSIS OF LARGE (100 G) SOIL AND SEDIMENT SAMPLES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W76-08613

THE RESPONSES OF SOILS AND SOIL MICROORGANISMS TO SILVER IODIDE WEATHER MODIFICATION AGENTS,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
R. A. Sokol, and D. A. Klein.
Journal of Environmental Quality, Vol. 4, No. 2, 211-214, April-June 1975. 4 fig, 18 ref.

Descriptors: *Soil chemistry, *Soil microorganisms, *Cloud seeding, *Organic matter, *Silver iodide, Microbial degradation, Soil environment.

To determine the consequences of AgI weather modification agent accumulation to the soil microbial environment, the effects of added silver compounds to microbial growth, anaerobic cellulose degradation, and the soil environment adjacent to a cloud seeding generator were investigated. Silver ion inhibited microbial growth in cultures at low concentrations and cultures saturated with AgI displayed an inhibition of growth initiation. An analysis of the soil surrounding a seeding generator site in Steamboat Springs, Colorado indicated that deposited silver tends to remain near the soil surface. Alterations in the soil environment due to high silver concentrations were indicated by consistently higher organic matter levels, water contents, microbial populations and rates of soil respiration. These results suggest that high concentrations of seeding agent potentially can alter the soil microbial environment by inhibiting organic matter decomposition, but that the silver levels which accumulate in seeded target areas should have no overt effects on the soil environment. (Skogerboe-Colorado State)
W76-08670

PHOSPHORUS MOVEMENT IN SOILS: SOIL-ORTHOPHOSPHATE REACTION KINETICS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-08672

THE IMPACT OF MOLYBDENUM-ENRICHED IRRIGATION WATER ON AGRICULTURAL SOILS NEAR BRIGHTON, COLORADO,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-08675

COMPARISON OF TWO PREDICTIVE NONEQUILIBRIUM ONE-DIMENSIONAL MODELS FOR PHOSPHORUS SORPTION AND MOVEMENT THROUGH HOMOGENEOUS SOILS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-08677

THE NITROGEN BALANCE OF ARCTIC TUNDRA: PATHWAYS, RATES, AND ENVIRONMENTAL IMPLICATIONS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W76-08678

NITRATE, PHOSPHATE, AND POTASSIUM MOVEMENT INTO DRAINAGE LINES UNDER THREE SOIL MANAGEMENT SYSTEMS,
Florida Univ., Fort Pierce. Inst. of Food and Agricultural Science.
For primary bibliographic entry see Field 5B.
W76-08680

THE USE OF LIKELIHOOD FUNCTIONS TO FIT CONCEPTUAL MODELS WITH MORE THAN ONE DEPENDENT VARIABLE,
Institute of Hydrology, Wallingford (England).
J. R. Douglas, R. T. Clarke, and S. G. Newton.
Journal of Hydrology, Vol. 29, No. 1/2, p 181-198, March 1976. 3 fig, 5 tab, 10 ref.

Descriptors: *Model studies, *Streamflow, *Soil moisture, Precipitation(Atmospheric), Evaporation, Mathematical models, Rivers, Watersheds(Basins), Runoff, Groundwater, Mathematics, Statistics, Correlation analysis, Hydrology.
Identifiers: Variables, Model calibration.

Models of catchment behavior usually express one output, or dependent variable, as a function of several inputs, or independent variables; streamflow is commonly the dependent variable and precipitation and evaporation are independent variables. Soil moisture may also be measured, however, and this may be regarded as a second dependent variable that is also a function of precipitation and evaporation. Work is described which had as one objective a study of the usefulness of available soil moisture records for assisting with model calibration. Incorporation of soil moisture data in the model calibration procedure was achieved by generalizing the commonly-used least squares criterion to a likelihood function, a generalization made at the expense of introducing further assumptions regarding the probability distribution of model residuals. Streamflow, soil moisture, precipitation and evaporation sequences were used from two experimental catchments. The goodness of model fit was determined for each catchment with streamflow as single dependent variable and with streamflow and soil moisture as jointly dependent variables. Model efficiency, as measured by a goodness of fit criterion, was very little changed by inclusion of the soil moisture sequence, suggesting that this supplied but little information on model parameters. This result can be explained by the sparseness of the soil moisture record, relative to streamflow. (Sims - ISWS)
W76-08729

MEASUREMENT OF SOIL MOISTURE IN POONA BLACK COTTON SOIL USING AN INFRA-RED MOISTURE BALANCE,
Meteorological Office, Poona (India).
R. R. Kelkar, and V. R. Chivate.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 26, No. 4, p 525-530, October 1975. 4 fig, 1 tab, 6 ref.

Descriptors: *Soil moisture, *Soil moisture meters, *Measurement, Moisture content, Infrared radiation, Soil temperature, Rainfall, Precipitation(Atmospheric), Evaporation, On-site investigations, Soils, Soil physical properties, Agriculture.
Identifiers: *India.

Measurements of soil moisture were made at 0, 15, 30 and 45 cm depths in black cotton soil at Poona in June-October 1973, using an infra-red moisture balance. The results were presented and discussed in relation to rainfall and evaporation. Throughout the active monsoon period, the soil moisture in the 30-45 cm layer remained more or less constant (25% by weight). Due to evaporation and infiltration into lower levels there was generally less moisture at 15 cm depth than at 30 or 45 cm. The moisture content of the surface layer was most variable (8 to 32%) and highly sensitive to rainfall and evaporation. An inverse relationship has been observed between soil moisture and soil temperature at any depth. (Sims-ISWS)
W76-08734

2H. Lakes

ON THE OCCURRENCE OF PRESSURE WATER IN LOW BOGS, (IN GERMAN),
Volkseigener Betriebsfestigkeit Wasserversorgung und Abwasserbehandlung, Rostock (East Germany).
A. Kirchner.
Arch Acker Pflanzenbau Bodenkd. 19(9), p 613-617, 1975.

Descriptors: *Bogs, Pressure, *Water pressure, Surveys, Sites, Decomposing organic matter.
Identifiers: Water-logged zones.

Pressure water-logged zones of low bogs which result from groundwater tension and which, in extreme cases, may resemble spring-water bogs are often neglected on site surveying. The following distinguishing features are explained: relief convexity, occurrence of spring-water calc-tufas, intensive peat decomposition, increased ochering and the specific type of waterlogging. The geohydrological situation and aspects of hydrotechnical amelioration are discussed. In most cases, these water-logged zones should be excluded from the farmland area for economic reasons, since effective drainage of these zones cannot be accomplished at reasonable costs.--Copyright 1976, Biological Abstracts, Inc.
W76-08105

BIOLOGICAL PROBLEMS OF A MANMADE SMALL LAKE, (IN GERMAN),
Innsbruck Univ. (Austria). Hygienisches Institut.
For primary bibliographic entry see Field 5C.
W76-08107

WATER VOLUME TRANSPORT AND OSCILLATORY CURRENT FLOW THROUGH THE STRAITS OF MACKINAC,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
J. H. Saylor, and P. W. Sloss.
Journal of Physical Oceanography, Vol. 6, No. 2, p 229-237, March 1976. 10 fig, 2 tab, 7 ref.

Descriptors: *Straits, *Flow, *Great Lakes, *Lake Michigan, *Lake Huron, Currents(Water), Current meters, Discharge(Water), Discharge measurement, Flow measurement, Average flow, Flow profiles, Limnology.
Identifiers: *Oscillatory current flow.

Currents flowing through the Straits of Mackinac were recorded for a period of nearly 100 days during the summer and fall of 1973. Current meters were placed at four moorings on a north-south cross section at the Straits' narrowest constriction and arranged to measure vertical profiles of horizontal current velocity. The mean water volume transport from Lake Michigan to Lake Huron was measured at nearly 1900 cu m/s. Seasonal variations in the vertical structure of the mean current flows were related to density stratification of the water mass. Spectral analyses of the current records revealed many periodic features of the flow field which were superimposed on the mean discharge. The periodic components were identified and correlated with oscillations of water level in the Michigan and Huron lake basins. (Sims - ISWS)
W76-08128

STEADY STRATIFIED CIRCULATION IN A CAVITY,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
D-L. Young, J. A. Liggett, and R. H. Gallagher.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol. 102, No. EM1, Proceedings Paper 11903, p 1-17, February 1976. 11 fig, 1 tab, 16 ref, 3 append. NSF GK-23992.

Descriptors: *Circulation, *Finite element analysis, *Lakes, *Thermal stratification, *Temperature, Thermocline, Analytical techniques, Diffusivity, Hydraulics, Winds, Numerical analysis, Model studies.
Identifiers: *Eddy diffusivity, *Eddy viscosity, Nonlinear turbulent models.

An attempt was made, by introducing empirically defined, depth-dependent expressions for eddy diffusivity and eddy viscosity into the governing equations for two-dimensional behavior, to solve the problem of steady-state stratified flow in a lake subjected to surface shear. The set of four relevant partial differential equations (two momentum equations, mass conservation and the temperature diffusion equation) was transformed to a pair of nonlinear differential equations in the stream func-

tion and density. Integral conditions corresponding to the solution of these equations were established through the weighted residual concept, and finite element representations of the integrals were constructed. The resulting system of nonlinear algebraic equations was solved by means of quasilinearization technique. An extensive series of numerical solutions was presented to demonstrate that the results obtained are of the type measured in the analogous field situation of wind-driven stratified lakes. (Singh-ISWS)
W76-08136

LAKE HURON SURFACE WATER TEMPERATURE, MAY-NOVEMBER, 1966,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Lab.
S. J. Bolsenga.
Water Resources Bulletin, Vol. 12, No. 1, p 147-156, February 1976. 6 fig, 2 tab, 6 ref.

Descriptors: *Lake Huron, *Great Lakes, *Temperature, Surface waters, *Water temperature, Air-water interfaces, Air temperature, Heat transfer, On-site data collections, Measurement, Isotherms.
Identifiers: *Surface water temperature, *Heat storage, Saginaw Bay, Manitoulin Island, De Tour Passage, Storage lag, Large lakes.

Data from seven vessel cruises from late May to early November permitted definition of the surface water temperature regime of Lake Huron on a monthly basis. Quantitative values were furnished for a portion of the warming, stable, and cooling periods. The lowest temperatures occurred near the center of the lake, southwest of Manitoulin Island, and at De Tour Passage. The highest temperatures occurred at the mouth of Saginaw Bay and in the southmost portions of the lake. Comparison of the surface water temperatures with temperatures in the 21-30 m layer showed the heat storage lag characteristic of large lakes. A dense network of stations which were reoccupied during a summer to early fall period was adequate for a detailed description of the surface water temperature of Lake Huron from reversing thermometer data. General agreement was shown between patterns of surface water temperature isolines from satellite images and those produced from vessel data, although different time periods prevented direct comparison. (Roberts - ISWS)
W76-08141

THE SELECTION OF PREY IN 3 MALACOPHAGOUS FISHES OF LAKE CHAD, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena.
L. Lauzanne.
Cah O R S T O M Ser Hydrobiol. 9(1), p 3-7, 1975.

Descriptors: Lakes, Africa, *Predation, Fish, *Fish food organisms, *Mollusks, Invertebrates.
Identifiers: Hyperopisus-Bebe, *Malacophagous, Stomach, Synodontis-Clarias, Synodontis-Schall, *Chad(Lake Chad).

Synodontis schall, S. clarias (Mochocidae) and Hyperopisus bebe (Mormyridae) feed almost exclusively on mollusks in the area studied (Chad). The comparison between stomach contents and the benthic mollusk fauna shows that the 3 fishes select small, immature mollusks. This behavior probably influences the dynamics of the mollusk populations.--Copyright 1976, Biological Abstracts, Inc.
W76-08178

THE EFFECT OF MINERAL ENVIRONMENT ON THE GEOHYDROLOGICAL SITUATION IN LOW BOG SITES, (IN GERMAN),
Volkseigener Betriebsfestigkeit Wasserversorgung und Abwasserbehandlung, Rostock (East Germany).
A. Kirchner.
Arch Acker Pflanzenbau Bodenkd. 19(9); p 605-611, 1975.

Descriptors: *Bogs, *Hydrogeology, *Mineralogy, Environmental effects, Sites.
Identifiers: Hydrotechnical amelioration, *Minerals.

The surface relief of the environment permits only broad conclusions as to the hydrological conditions in a low bog site. The geological structure of the mineral underground, including the border region, offers valuable information on the specific geohydrological situation. Nine common natural structural types of low bogs are presented using schematic profile sections. Their geohydrological indicativeness is explained. Conclusions are drawn for hydrotechnical amelioration.--Copyright 1976, Biological Abstracts, Inc.
W76-08184

SOME PROBLEMS OF THE ECOLOGY OF THE SARY-CHILEK MARINKA SCHIZOTHORAX INTERMEDIUS EURY-CEPHALUS SPELTER, (IN RUSSIAN),
Tashkent Univ. (USSR).
Z. Y. Il'yasova.
Vopr Ikhtiol. 15(2), p 226-232, 1975.

Descriptors: Fish population, Lakes, Ecology, Juveniles.
Identifiers: *Marinka, *Schizothorax-Intermedius-Eury-cephalu, *USSR(Uzbek-SSR), Lake Sary-Chilek.

The Sary-Chilek marinka S intermedius eurycephalus is widespread, and it is the only fish species in Lake Sary-Chilek in the Uzbek SSR (USSR). It occurs in small rivers and streams emptying into the lake, in neighboring lakes and in the basin of the Syr Darya. The Sary-Chilek marinka is represented by 2 morphs (typical-mouthed and thick-lipped) and 2 ecological forms (lake and river). Data are given on the ecology of juvenile and adult marinka.--Copyright 1976, Biological Abstracts, Inc.
W76-08243

AN ECOLOGIC SURVEY OF LAKE ENDINE, (IN ITALIAN),
For primary bibliographic entry see Field 5C.
W76-08244

THE EFFECT OF CONTROLLED EUTROPHICATION ON SOLAR RADIATION PENETRATING INTO PONDS, (IN POLISH),
Polish Academy of Sciences, Golysz. Fish Culture Station.
For primary bibliographic entry see Field 5C.
W76-08305

CLADOCERA AND GASTROPODA POPULATION ECOLOGY IN THE DANUBE FLOOD PLAIN, (IN ROMANIAN),
St. Negrea, and A. Negrea.
232p. Editura Academiei Republicii Socialiste Romania: Bucharest, Romania. 1975.

Descriptors: *Ecology, Europe, Flood plains, Light, *Crustaceans, *Gastropods, *Food chains, Fish food organisms, Phytoplankton, Lakes, Dams, Temperature, Winds, Ecological distribution.
Identifiers: *Romania(Danube River flood plain).

The study centers on Lakes Crapina and Jijila (Romania), and the system of smaller lakes and canals surrounding them during flood stages and, in the case of Jijila, after the erection of dams. Modifications in lake structure and morphology caused by flood conditions and by gastropod populations; effects of temperature, light and wind; an physicochemical and phytoplanktonic factors affecting population dynamics in this lake complex was discussed. The statistical methods used in the population study and the role of Cladocera and Gastropoda in food chains, including their consumption by economically important fishes, were examined. Ecologic significance and distribution of 53 cladoceran and 15 gastropod species and variation in the composition of associations according to season and flood conditions were also studied.--Copyright 1976, Biological Abstracts, Inc.
W76-08308

SOME CHARACTERISTICS OF FAT METABOLISM IN TWO FORMS OF CHAR SALVELINUS ALPINUS (L.) FROM LAKE AZABACH (KAMCHATKA), (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Ichthyology.
V. E. Matsuk, and V. I. Lapin.
Vopr Ikhtiol. 12(5), p 917-922, 1972.

Descriptors: *Metabolism, Fish food organisms, Lakes, Seasonal, *Trout.
Identifiers: *Salvelinus-Alpinus, *USSR(Lake Azabach), Fat metabolism(Fish).

The fat metabolism in a predatory and a mollusk-eating form of Salvelinus alpinus (L.) from Lake Azabach (Kamchatka) (USSR) was studied. Fat accumulation, mostly in muscles and the intestines, was observed. While the predatory form showed no significant yearly variations in its fat content, the mollusk-eating variety had maximum fat content by fall and a minimum in early spring.--Copyright 1976, Biological Abstracts, Inc.
W76-08310

CORALVILLE WATER QUALITY STUDY, ANNUAL REPORT, WATER YEAR OCTOBER 1, 1974 TO SEPTEMBER 30, 1975,
Iowa University, Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5A.
W76-08324

EUTROPHICATION OF MICROPONDS,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 5C.
W76-08354

FACTORS AFFECTING THE CONTRIBUTION BY EPIPHYTIC ALGAE TO THE PRIMARY PRODUCTIVITY OF AN OLIGOTROPHIC FRESHWATER LAKE,
Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-08357

PYRAMID LAKE: ZOOPLANKTON DISTRIBUTION AND BLOOMS OF THE BLUE GREEN ALGA, NODULARIA SPUMIGENA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5C.
W76-08374

THE HALTON-WENTWORTH WATERFRONT STUDY, VOLUME 1, CONCEPTS FOR WATERFRONT DEVELOPMENT (SUMMARY).
Acres Consulting Services Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 6B.
W76-08382

EASTERN LAKE ONTARIO PRECIPITATION NETWORK,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2B.
W76-08412

MEASUREMENTS OF CURRENT FLOW DURING SUMMER IN LAKE HURON,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
P. W. Sloss, and J. H. Saylor.
NOAA TR ERL 353-GLERL 5 (GLERL Contribution No. 56), July 1975. 39 p, 17 fig, 12 ref.

Descriptors: *Currents(Water), Flow, *Flow measurement, *Water circulation, Circulation, Velocity, *Lake Huron, Oceanography.
Identifiers: *Current vectors, Vector velocity, *Oscillatory currents, Spectra, Spectrum analysis.

Reanalyses of the data from the 1966 Great Lakes-Illinois River Basin Project (GLIRBP) of the (then) Federal Water Pollution Control Administration (FWPCA) reveal some of the large-scale, persistent summertime circulation patterns in Lake Huron. The greatest density of data from the original 45 current meter moorings covers June through August 1966, when some 21 stations returned synoptically-significant data from meters at depths of 10 and 15 m. From this somewhat sparse sample, it is deduced that at 10-m depth a counterclockwise circulation dominates the northern 2/3 of the lake. The shallower southern portion shows a more complex pattern, with generally southward flow along the shorelines on both sides and a return flow northward near the centerline of the southern basin. This latter pattern may decay later in the summer, but the data become too patchy for definite analysis. The data set from 15-m depth indicates similar circulations. Special analysis of currents at individual stations reveals a strong inertial rotation of the current vector at open-lake sites. (NOAA)
W76-08413

ELECTROPHYSIOLOGICAL STUDIES OF MORPHOLINE-IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH) AND RAINBOW TROUT (SALMO GAIRDNERI),
Wisconsin Univ., Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08438

EXPERIMENTAL CONFIRMATION OF THE OLFACTORY HYPOTHESIS WITH HOMING, ARTIFICIALLY IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH),
Wisconsin Univ., Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08439

NOTE ON THE DISTRIBUTION OF MERCURY IN FISH SPECIES IN THREE OHIO LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5C.
W76-08441

EFFECT OF CRUDE OIL ON POPULATIONS OF BACTERIA AND ALGAE IN ARTIFICIAL PONDS SUBJECT TO WINTER WEATHER AND ICE FORMATION,
For primary bibliographic entry see Field 5C.
W76-08453

FORMS OF PHOSPHORUS IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08527

FORMS OF IRON AND MANGANESE IN LAKE ERIE WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08528

SEDIMENT YIELDS AND NUTRIENT LOADINGS FROM CANADIAN WATERSHEDS TRIBUTARY TO LAKE ERIE: AN OVERVIEW,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 5B.
W76-08529

NUMERICAL COMPUTATIONS OF ADVECTIVE AND DIFFUSIVE TRANSPORTS OF CHLORIDE IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08530

COMPUTATIONS OF PHYSICAL TRANSPORT AND REGENERATION OF PHOSPHORUS IN LAKE ERIE, FALL 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08531

DATA ON SELECTED LAKES IN WASHINGTON, PART 3,
Geological Survey, Tacoma, Wash.
G. C. Bortleson, G. T. Higgins, J. B. McConnell, and J. K. Innes.
Washington Department of Ecology, Olympia, Water-Supply Bulletin 42, Part 3, 1976. 143 p, 1 fig, 28 ref.

Descriptors: *Water quality, *Lakes, *Washington, *Basic data collections, Chemical properties, Biological properties, Physical properties, Maps, Lake morphometry, Bathymetry, Aerial photography, Water analysis, Water utilization.

Chemical, biological, and physical data are included for 28 lakes in Washington. For each lake there is a description of the physical setting, a general discussion of water quality, a bathymetric map, and an aerial photograph. The basic data include depth profiles of dissolved-oxygen concentration and temperature. Each lake was sampled four times in 1972, from winter to late summer. (See also W74-12341 and W73-10654) (Woodard-USGS)
W76-08564

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 3. KITSAP, MASON, AND PIERCE COUNTIES,
Geological Survey, Tacoma, Wash.
G. C. Bortleson, N. P. Dion, J. B. McConnell, and L. M. Nelson.
Washington Department of Ecology, Olympia, Water-Supply Bulletin 43, Vol 3, 1976. 259 p, 1 fig, 13 ref.

Descriptors: *Lakes, *Lake morphology, *Lake morphometry, *Water quality, *Washington, Data collections, Bathymetry, Aerial photography, Lake shores, Mapping, Water analysis, Physical properties, Chemical analysis.
Identifiers: Western Washington lakes.

A total of 91 lakes in three counties (Kitsap, Mason, and Pierce) of western Washington was sampled using helicopter or boat to obtain information on lake physical, cultural, and water-quality conditions. Physical parameters were determined from topographic and bathymetric (bottom-contour) maps of the lakes. If bathymetric maps were not available, the lakes were sounded and charted using a continuous-recording fathometer. By use of aerial photographs and lake depths, the bathymetric daanta were digitized and transferred to computer cards which served as input to a computerized program that calculated lake morphometric parameters (for example, lake volume, surface area, and length of shoreline). Vertical profiles of temperature and dissolved oxygen were measured in the deepest part of each lake. Secchi-disc visibility was determined also. Water samples were collected for color, nutrient, and specific-conductance analyses at depths 3.0 feet below the water surface and 3-5 feet above the lake bottom. Samples for fecal-coliform bacteria were collected at selected nearshore sites, approximately 100 feet offshore at a depth of 1 foot below the water surface. (Woodard-USGS)
W76-08565

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 4. CLARK, COWLITZ, GRAYS HARBOR, LEWIS, PACIFIC, SKAMANIA, AND THURSTON COUNTIES,
Geological Survey, Tacoma, Wash.
G. C. Bortleson, N. P. Dion, J. B. McConnell, and L. M. Nelson.
Washington Department of Ecology Olympia, Water-Supply Bulletin 43, Vol 4, 1976. 197 p, 1 fig, 14 ref.

Descriptors: *Lakes, *Lake morphology, *Lake morphometry, *Water quality, *Washington, Data collections, Bathymetry, Aerial photography, Lake shores, Mapping, Water analysis, Physical properties, Chemical analysis.
Identifiers: Southwestern Washington lakes.

A total of 69 lakes in seven counties (Clark, Cowlitz, Grays Harbor, Lewis, Pacific, Skamania, and Thurston) of southwestern Washington was sampled using helicopter or boat to obtain information on lake physical, cultural, and water-quality conditions. Physical parameters were determined from topographic and bathymetric (bottom-contour) maps of the lakes. If bathymetric maps were not available, the lakes were sounded and charted using a continuous-recording fathometer. By use of aerial photographs and lake depths, the bathymetric data were digitized and transferred to computer cards which served as input to a computerized program that calculated lake morphometric parameters (for example, lake volume, surface area, and length of shoreline). Vertical profiles of temperature and dissolved oxygen were measured in the deepest part of each lake. Secchi-disc visibility was determined also. Water samples were collected for color, nutrient, and specific-conductance analyses at depths 3.0 feet below the water surface and 3-5 feet above the lake bottom. Samples for fecal-coliform bacteria were collected at selected nearshore sites, approximately 100 feet offshore at a depth of 1 foot below the water surface. (Woodard-USGS)
W76-08566

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 5. CHELAN, FERRY, KITTITAS, KLICKITAT, OKANOGAN, AND YAKIMA COUNTIES,
Geological Survey, Tacoma, Wash.
N. P. Dion, G. C. Bortleson, J. B. McConnell, and L. M. Nelson.
Washington Department of Ecology Olympia, Water-Supply Bulletin 43, Vol 5, 1976. 264 p, 1 fig, 14 ref.

Descriptors: *Lakes, *Lake morphology, *Lake morphometry, *Water quality, *Washington, Data collections, Bathymetry, Aerial photography, Lake shores, Mapping, Water analysis, Physical properties, Chemical analysis.
Identifiers: East-central Washington lakes.

A total of 87 lakes in six counties (Chelan, Ferry, Kittitas, Klickitat, Okanogan, and Yakima) of east-cental Washington was sampled using helicopter or boat to obtain information on lake physical, cultural, and water-quality conditions. Physical parameters were determined from topographic and bathymetric (bottom-contour) maps of the lakes. If bathymetric maps were not available, the lakes were sounded and charted using a continuous-recording fatometer. By use of aerial photographs and lake depths, the bathymetric data were digitized and transferred to computer cards which served as input to a computerized program that calculated lake morphometric parameters (for example, lake volume, surface area, and length of shoreline). Vertical profiles of temperature and dissolved oxygen were measured in the deepest part of each lake. Secchi-disc visibility was determined also. Water samples were collected for color, nutrient, and specific-conductance analyses at depths 3.0 feet below the water surface and 3-5 feet above the lake bottom. Samples for fecal-coliform bacteria were collected at selected nearshore sites, approximately 100 feet offshore at a depth of 1 foot below the water surface. (Woodard-USGS)
W76-08567

HYDROLOGY OF THE THREE SINKHOLE BASINS IN SOUTHWESTERN SEMINOLE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-08572

STUDY OF THE BEHAVIOUR OF TRANSURANICS AND POSSIBLE CHEMICAL HOMOLOGUES IN LAKE MICHIGAN WATER AND BIOTA,
Argonne National Lab. Ill.
For primary bibliographic entry see Field 5C.
W76-08598

PLUTONIUM AND AMERICIUM IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W76-08606

ABUNDANCE AND BIOMASS OF BACTERIOPLANKTON OF 'TASTAKA' PONDS, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-08664

A SIX-YEAR WATER, PHOSPHORUS, AND NITROGEN BUDGET FOR SHAGAWA LAKE, MINNESOTA,
National Environmental Research Center, Corvallis, Oreg. Eutrophication and Lake Restoration Branch.
For primary bibliographic entry see Field 5C.
W76-08674

BASELINE CONCENTRATIONS OF POLYCHLORINATED BIPHENYLS AND DDT IN LAKE MICHIGAN FISH, 1971,
National Water Quality Laboratory, Duluth, Minn.
For primary bibliographic entry see Field 5A.
W76-08685

A BRIEF CHARACTERIZATION OF SHOALS AND THEIR PLANT COVER IN THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hydrobiologii.
I. L. Korelyakova.
Gidrobiol Zh. 11(2), p 12-17, 1975.

Descriptors: *Reservoirs, *Cover crops, *Shoals. Identifiers: Kremenchug Reservoir, Ukrainian-SSR, USSR.

Seven big shoals in the Kremenchug Reservoir (Ukrainian SSR, USSR) are characterized. The occupied area, the initial state of the flooded areas and the present state of the plant cover are discussed.--Copyright 1976, Biological Abstracts, Inc.
W76-08697

LAKE ERIE AND ITS BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
P. G. Sly.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 355-370, March 1976. 8 fig, 28 ref.

Descriptors: *Bathymetry, Lake Erie, *Bedrock, Geology, Climates, Temperature, Land use, *Water quality, Fish stocking, Pleistocene epoch, Land development, Industries, Agriculture, Fish populations.
Identifiers: *Lake Erie basin, Settlements, Overfishing.

The bathymetry of Lake Erie was separated into Western, Central, and Eastern basins, whose form and feature have been strongly influenced by bedrock geology and the effects of Pleistocene events. The climatic regime is mid-continental but was modified by the overall effect of the Great Lakes; mean annual temperatures had a range of about 21 C. European settlement in the basin began in the early 1800's and land use patterns and historic settlement differ distinctly north and south of the lake. Changes in Lake Erie water quality are strongly associated with both agricultural and industrial development, but did not become severe until towards the end of the 1930's. However, changes and depletion of fish stocks likely owe as much to overfishing as to changes in water quality. (Roberts-ISWS)
W76-08723

CONTINUOUS DYNAMICAL COMPUTATIONS OF WATER TRANSPORTS IN LAKE ERIE FOR 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
T. J. Simons.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 371-384, March 1976. 4 fig, 1 tab, 8 ref.

Descriptors: *Model studies, *Lake Erie, *Water circulation, *Mathematical models, Computer models, Circulation, Winds, Wind tides, Wind pressure, Water levels, Thermocline, Stratification, Thermal stratification, Hypolimnion, Epilimnion, Limnology, Lakes, Distribution patterns.

A numerical model of Lake Erie has been used to compute water transports throughout the 1970 shipping season on the basis of continuous wind observations from six shore stations. A vertically integrated model was used for quasi-homogeneous conditions, and a two-layer model was employed to simulate summer stratification. The computed water circulations were retained for a study of the horizontal distribution of various chemical parameters measured by regular ship cruises on the lake during this period. Computed surface elevations were compared with observed water level data to verify the model calculations and to adjust the windstress coefficient from month to month. The coefficient of correlation between observed and computed Buffalo-minus-Toledo water setup averages out to .95 for the complete integration period. In addition, a comparison was made of model results and available data from current meters maintained in the lake during this period. The results showed the feasibility of quasi-operational applications of a model of the present type for computing the necessary water transport information for ecosystems modeling and water resources planning. (Sims-ISWS)
W76-08724

SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08725

RATES OF ACCUMULATION OF PHOSPHORUS FORMS IN LAKE ERIE SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08726

CULTURAL IMPACT ON THE GEOCHEMISTRY OF SEDIMENTS IN LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08727

DISTRIBUTIONS OF BOD AND DO IN RIVERS AND LAKES,
Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Ingenieria.
For primary bibliographic entry see Field 5B.
W76-08743

COMPUTER MAPPING OF TURBIDITY AND CIRCULATION PATTERNS IN SAGINAW BAY, MICHIGAN FROM LANDSAT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W76-08746

2I. Water In Plants

ENERGY CONTENT OF THE BENTHOS AND EPIFAUNA IN THE PONGOLA RIVER, NATAL, (IN AFRIKAANS),
Potchefstroom Univ. for Ch. H. E. (South Africa). Inst. of Dierkundige Navorsing.
M. C. Roode, and C. Combrinck.
Wet Bydraes P U (Potchefstroomse Universiteit) CHO (Christelike Hoere Onderwys) Reeks B Natuurwet. 30, p 1-8, 1975.

Descriptors: *Benthos, Rivers, Africa, Aquatic animals, *Energy, Productivity.
Identifiers: Branchiura-sowerbyi, Caridina-nilotica, Natal, *South Africa(Pongola River), *Epifauna.

The collection of benthos and epifauna in the Pongola River (South Africa), completed between 1967 and 1969, was a part of the International Biological Program on freshwater productivity studies. This project was concerned with the part of the river that will be occupied by the new Strijdom Dam. A total of 53 different species were identified. A definite negative correlation existed between the mean energy value and mean mass of specimens of Branchiura sowerbyi. A greater mass increase between seasons means lower energy values. The large specimens of this species evidently have a lower energy value per gram than the smaller specimens. This finding coincides with the relatively high percentage of energy-poor mud in their intestines. Caridina nilotica has the same pattern as B. sowerbyi.--Copyright 1976, Biological Abstracts, Inc.
W76-08158

STUDIES ON THE ANIMAL COMMUNITIES IN TWO NORTH FLORIDA SALT MARSHES. PART I. FISH COMMUNITIES,
Florida Agricultural and Mechanical Univ., Tallahassee.
For primary bibliographic entry see Field 2L.
W76-08161

METHOD OF STUDYING THE SPATIAL DISTRIBUTION OF ORGANISMS, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science; and Moscow State Univ. (USSR). Dept. of Invertebrate Zoology.
For primary bibliographic entry see Field 7B.
W76-08176

MODELS OF ACTUAL COMMUNITIES,
For primary bibliographic entry see Field 8I.
W76-08219

AGE COMPOSITION AND GROWTH OF ASPIUS ASPIUS (L.) IN THE LOWER VOLGA, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
L. K. Opalatenko, and A. A. Mukheisin.
Gidrobiol Zh. 11(1); p 72-78, 1975.

Descriptors: *Fish, *Rivers, *Growth rates, Age, Aging(Biological).
Identifiers: *Aspius-Aspius, Russian-SFSR, USSR, *Volga River.

On the basis of spring-summer catches of A. aspius (L.) it was determined that 4-5yr individuals 40-52 cm long weighing 800-2000 g dominated in the section of the river investigated (Russian SFSR, USSR). The most intensive growth of A. aspius (L.) occurs at the age of 2-3 yr. The fish taken for food should be larger, favoring a smaller catch of 1st yr females.--Copyright 1976, Biological Abstracts, Inc.
W76-08255

SOIL MOISTURE REGIME AND PIGMENT CONTENT IN LEAVES OF CEREALS, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Insr. of Experimental Botany.
For primary bibliographic entry see Field 3F.
W76-08304

CHANGE OF THE CONTENT AND STATE OF PIGMENTS IN LEAVES OF MALE AND FEMALE HEMP IN RELATION TO NUTRITION AND SOIL MOISTURE CONTENT, (IN RUSSIAN),
Kabardino-Balkarski Gosudarstvennyi Universitet, Nalchik (USSR).
L. K. Slonov.
Izv Sev-Kavak Nauchn Tsentra Vyssh Shk Estestv Nauki. 2(3), p 49-52, 1974.

Descriptors: *Soil moisture, *Moisture content, Chlorophyll, Nutrients, *Leaves, Fertilizers, Crop response.
Identifiers: Carotene, *Hemp leaves, Lutein, *Mineral fertilizers, Pigments, *USSR(Kabardino-Balkar ASSR), Violaxanthin.

Under field conditions in the steppe zone of the Kabardino-Balkar ASSR (USSR) the effect of mineral fertilizers and of a combination of mineral and organic fertilizers on the control of chlorophylls a and b in hemp leaves on unirrigated and irrigated lands was studied. Greater production of chlorophyll occurred in the leaves of the female plants than in the male. Fertilizer promoted an increase in the strength of the bond of chlorophyll to the protein-lipid complex in the leaves, especially in female plants. The effect of mineral and organic-mineral fertilizers was expressed also in an increase in the content of carotene, lutein and violaxanthin in leaves, especially in female plants.--Copyright 1976, Biological Abstracts, Inc.
W76-08306

CARBOHYDRATE TRANSFORMATION IN WHEAT AND RYE PLANTS UNDER EFFECT OF FLOODING IN THE AUTUMN-WINTER PERIOD, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
For primary bibliographic entry see Field 3F.
W76-08307

THE STATE OF WATER IN PLANT TISSUES AT NEGATIVE TEMPERATURES UNDER NATURAL CONDITIONS, (IN RUSSIAN),
Kirov Agric. Inst., Kirov, USSR.
L. I. Krasovskii, and V. A. Chashchukhin.
Fiziol Rast. 21(5); p 975-979, 1974.

Descriptors: *Moisture content, *Plant tissues, *Environmental effects, *Cold resistance.
Identifiers: Abies-Sibirica, Acer-Negundo, Betula-Pendula, Juniperus-Communis, Pinus-Sylvestris, Populus-Tremula, Salix-Triandra, Vaccinium-Myrtillus, Cold temperatures.

The content of non-frozen water was studied in living tissues and tissues and tissues killed by boiling of woody plants under natural conditions in the winter of 1970-1971 and in the winter of 1971-1972. The following plants were studied: Pinus silvestria (= P. sylvestris) (pine-needles), Abies sibirica, Juniperus communis, Populus tremula, Vaccinium myrtillus, Acer negundo, Betula pendula and Salix triandra. At -10C, 40% water in P. silvestris and 60% water in V. myrtillus did not freeze. Nonfrozen water was found in the living and in the killed plants. Extracellular water presumably did not freeze in the living branches.--Copyright 1976, Biological Abstracts, Inc.
W76-08368

REARING THE SEVAN TROUT AT THE AIGERLICH TROUT POND FISHERY, (IN ARMENIAN),
M. E. Gambaryan, and G. A. Oganesyan.
Biol Zh Arm. 28(1), p 106-108, 1975.

Descriptors: *Trout, *Fisheries, *Growth rates, Fish stocking, Fish reproduction.
Identifiers: Aigerlich Trout Fishery, Armenian-SSR, Gegarkuni, *Sevan trout, USSR.

Experiments carried out in 1970-1971 showed that it is possible to rear commercial Sevan trout (Salmo ischchan gegarkuni) in the Aigerlich trout pond fishery of the Ararat Valley (Armenian SSR, USSR). The Sevan trout surpasses the rainbow trout in rate of growth.--Copyright 1976, Biological Abstracts, Inc.
W76-08371

ECOLOGY AND PROSPECTS OF USING THE AMPHIPOD GAMMARUS (R.) BALCANICUS SCHAEF, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
I. A. Zubchenko.
Vestn Zool. 3, p 42-47, 1975.

Descriptors: *Ampiphoda, *Fish food organisms, *Cultivation.
Identifiers: *Fish food, Amphipod, *Gammarus-Balcanicus, USSR, Caucasus, Carpathian area.

G. balcanicus Schaf. is a high-quality food for domestic animals and fish. Experiments showed the development of methods for its mass cultivation to be feasible. The Carpathian area and Caucasus (USSR) are potential regions for collection of these animals.--Copyright 1976, Biological Abstracts, Inc.
W76-08410

STUDY OF SELF-DIFFUSION OF WATER AND ITS ACTIVATION ENERGY IN CELLS OF DIFFERENT PLANT TISSUES, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
F. G. Miftakhutdinova, A. V. Anisimov, and G. A. Velikanov.
Fiziol Biokhim Kul't Rast. 7(3),p 298-300, 1975.

Descriptors: *Plant tissues, Moisture uptake, Movement, Beans, Corn(field), Temperatures, Diffusion.
Identifiers: Cucumbers, Peas.

In different plant tissues (pea, bean, corn, cucumber) the activation energy of intracellular water self-diffusion within a temperature range of 20-45C is practically the same as that of pure water and within a region of 5-25, it is the same or somewhat lower. The absolute level of values of the coefficient of water self-diffusion in a cell and of the activation energy shows that the bulk of intracellular water, except for water of hydration, does not differ essentially by its structure and properties from pure water.--Copyright 1976, Biological Abstracts, Inc.
W76-08429

POSSIBILITY OF DETERMINING THE RATE OF SEASONAL RADIAL GROWTH OF TRUNKS AND CHANGES IN THE WATER REGIME OF TREES USING A PHOTOMETRIC CURVE, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
E. A. Vaganov, V. V. Smirnov, and I. A. Terskov.
Ekologiya. 6(2), p 45-53, 1975.

Descriptors: *Trees, *Growth, *Seasonal, *Regimes, *Moisture availability, *Growth rates, *Analytical techniques, *Photometry, Xylem.
Identifiers: Trunks(Trees), Growth rings.

The relation between the reflection of light by structural elements of the annual rings and radial growth rate of spruce trees was investigated. The porosity distribution of the wood correlates with the growth rate of the xylem cells during the vegetation period. Local decreases in porosity of individual zones of the annual rings occur as a consequence of changes in the tree's water regime. The possibility of using photometric curves for analyzing the seasonal growth of the trunk and other tree parts is discussed.--Copyright 1976, Biological Abstracts, Inc.
W76-08521

AN AQUATIC TECHNIQUE FOR COLLECTING SMALL ADULT INSECTS,
Murray State Univ., Ky.
For primary bibliographic entry see Field 7B.
W76-08574

AN EXPERIMENT ON THE FEEDING OF FRY OF CATFISH HETEROPNEUSTES FOSSILIS,
Bangladesh Agricultural Univ., Mymensingh. Faculty of Fisheries.
M. F. Huq, M. K. Haque, I. Haque, and A. K. M. Aminul.
Indian J Fish. 20(1), p 35-42, 1973.

Descriptors: *Catfishes, *Fry, *Fish diets.
Identifiers: Heteropneustes-Fossilis.

An experiment was conducted to determine a suitable feed for the fry of catfish, H. fossilis. Of the 6 types of feed tried, 5 had a common base of vegetable origin. The feeds differed only in their animal protein components. Feed I (with meat offal and fish meal) and Feed II (with meat offal and blood meal) and Feed III (with lysine-cum-methionine) gave the best results. Feed consisting of only fish meal with no vegetable base resulted in weight reduction of the fry.--Copyright 1975, Biological Abstracts, Inc.
W76-08575

EFFECT OF SOLAR ENERGY AND WATER ON PLANT PRODUCTIVITY (IN BULGARIAN),
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Hydrotechnical Lab.
H. C. Aslyng.
Fiziol Rast (Sofia) 1(2), p 103-114, 1974. (Engl. summ.).

Descriptors: *Plant growth, *Solar radiation, *Moisture availability, *Analytical techniques, Measurement, Plant physiology, Corn sugar cane, *Carbon dioxide.

The activities of the Hydrotechnical Laboratory and the attached Climatic and Water Balance Station (Denmark) are discussed. Facilities and methods for recording climatic and plant physiological data are described. Results are reported for different parameters determining plant (corn, sugarcane) production, such as solar energy for photosynthesis, light requirement and the rate of different factors providing for maximum production. The effect of CO2 was especially considered.
W76-08576

ZOOPLANKTON SURVIVAL IN COOLING WATER SYSTEMS OF FOUR THERMAL POWER PLANTS ON THE CALIFORNIA COAST-INTERIM REPORT. MARCH 1971-JANUARY 1972,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
For primary bibliographic entry see Field 5C.
W76-08630

ROLE OF GROUNDWATERS IN REDISTRIBUTION OF SOLAR RADIATION BY A PHYTOCENOSIS, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Inst. of Experimental Botany.
L. P. Smolyak, U. R. Reutski, V. R. Filistovich, and Zh. I. Kazlova.
Vyestsi Akad Navuk B SSR Syer Biyal Navuk. 1, p 30-35, 1975.

Descriptors: *Solar radiation, *Groundwater, *Plant growth, Leaves, *Soil-water-plant relationships.
Identifiers: *Phytocenosis.

An investigation of the effect of groundwater on phytoclimate established that, depending on depth, a certain amount of water and air is found in the arable soil horizon which determines growth and leaf vigor in the phytocenose. The leaf surface of plants actively participates in the redistribution of solar energy. The quantity of solar radiation reflected and adsorbed by the crop and redistributed by the soil was established. The data are compared with the leaf index and groundwater level.--Copyright 1975, Biological Abstracts, Inc.
W76-08665

DEPENDENCE OF STOMATAL NUMBER AND SIZE IN JUGLANS REGIA L. ON ECOLOGICAL CONDITIONS, (IN BULGARIAN),
Bulgarian Academy of Sciences, Sofia. Inst. of Botany.
N. Jotsova-Baurenska.
Fitologiya. 1, p 19-24, 1975.

Descriptors: Trees, *Stomata, *Water requirements, Moisture stress, Soil-water-plant relationships, Ecology.
Identifiers: Ecological, Exposure, Juglans-Regia, *Persian walnut, Walnut.

Measurements were made on stomatal number and size in J. regia L. under different ecological conditions. The results were related to the water regime of the Persian walnut. Reduction of soil moisture and higher meteorological stress led to a greater number of stomata, reduced moisture content in the leaves and an increased water deficit. This relationship was best expressed in walnuts growing on talus and having a southern exposure.--Copyright 1976, Biological Abstracts, Inc.
W76-08668

2J. Erosion and Sedimentation

USE AND MISUSE OF THE UNIVERSAL SOIL LOSS EQUATION,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
W. H. Wischmeier.
Journal of Soil and Water Conservation, Vol. 31, No. 1, p 5-9, January-February 1976. 2 fig, 10 ref.

Descriptors: *Soil erosion, *Equations, *Erosion control, *Farm management, *Runoff, *Soil conservation, Sheet erosion, Sediment yield, Soil types, Rill erosion.
Identifiers: *Soil loss equation, Soil-erodibility factor, Iso-erodent map.

The universal soil loss equation was designed to predict soil loss from sheet and rill erosion. Variables affecting this erosion are grouped under six major erosion factors related to erosive forces of rainfall and runoff, inherent erodibility of a particular soil, shape and slope characteristics of the field, farm practices, and land management. The relation of a particular factor to soil loss is often appreciably influenced by the levels at which other factors are present. Computed soil loss is the best available estimate rather than an absolute value. The soil loss equation can be used to predict average annual soil movement to guide the selection of suitable conservation practices, to estim the comparative utility of cropping systems, to determine optimum level of cropping and maximum tolerable slopes, and to provide soil loss data for erosional control needs. The researcher has to exercise judgment in selecting pertinent factor values that will account for differences from averages and for differences from field conditions and normal field operations. (Singh - ISWS)
W76-08120

SUSPENDED MATERIAL TRANSPORT: NARRAGANSETT BAY AREA, RHODE ISLAND,
Rhode Island Univ., Kingston, Graduate School of Oceanography.
For primary bibliographic entry see Field 2L.
W76-08139

OREGON COAST SHORELINE CHANGES DUE TO JETTIES,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 8B.
W76-08342

SIMULATION OF HYDRAULIC PROCESSES IN OPEN CHANNELS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-08344

AN IGNITION METHOD FOR DETERMINATION OF TOTAL PHOSPHORUS IN LAKE SEDIMENTS,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 5A.
W76-08346

THE PLANKTON TOWER. I. A STRUCTURE TO STUDY WATER/SEDIMENT INTERACTIONS IN ENCLOSED WATER COLUMNS,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W76-08446

THE PLANKTON TOWER. II. RELEASE OF NUTRIENTS FROM SEDIMENTS DUE TO CHANGES IN THE DENSITY OF BOTTOM WATER,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W76-08447

THE GROUNDWATER OUTCROP-EROSION MODEL; EVOLUTION OF THE STREAM NETWORK IN THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Instituut voor Aardwetenschappen.
For primary bibliographic entry see Field 2A.
W76-08515

THE ROLE OF ORGANIC DETRITUS IN THE FORMATION OF DISTINCTIVE SANDY TIDAL FLAT SEDIMENTARY STRUCTURES, TAY ESTUARY, SCOTLAND,
Dundee Univ., Newport-on-Tay (Scotland). Tay Estuary Research Center.
For primary bibliographic entry see Field 2L.
W76-08524

MERCURY IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08526

FORMS OF PHOSPHORUS IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08527

FORMS OF IRON AND MANGANESE IN LAKE ERIE WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08528

SEDIMENT YIELDS AND NUTRIENT LOADINGS FROM CANADIAN WATERSHEDS TRIBUTARY TO LAKE ERIE: AN OVERVIEW,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 5B.
W76-08529

COMPUTATIONS OF PHYSICAL TRANSPORT AND REGENERATION OF PHOSPHORUS IN LAKE ERIE, FALL 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08531

SOIL LOSS FROM ILLINOIS FARMS - ECONOMIC ANALYSIS OF PRODUCTIVITY LOSS AND SEDIMENTATION DAMAGE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4D.
W76-08533

FUNDAMENTAL ASPECTS OF EROSION OF COHESIVE SOILS,
California Univ., Davis. Dept. of Civil Engineering.
K. Arulanandan.
Journal of the Hydraulics Division, Proceeding ASCE, Vol. 101, No. HY5, p 635-639, May 1975. 4 fig, 1 tab, 11 ref.

Descriptors: *Erosion, *Cohesive soils, Erosion rates, *Dispersion clays, Mineralogy, Pores, *Cation exchange, Ion exchange, Soil types, *Soil erosion.
Identifiers: Soil swelling, Cation exchange capacity.

The influence of soil systems at different dispersed states on erodibility and swelling is well demonstrated. The degree of dispersion of the soil as influenced by mineralogy, amount of clay, soil pore fluid, (SAR), concentration of pore fluid, and the differences in the concentration between the pore and eroding fluids have to be considered in evaluating the erosion potentials of soils. For prediction of erodibility, a tentative relationship between cation exchange capacity (CEC) (a value which varies with or depends on the type of clay) and critical shear stress at a particular concentration of pore fluid at low and high values of SAR is presented. Experimental and theoretical investigation of erosion is in progress to obtain a functional relationship between structural parameters quantified in terms of electrical properties and erodibility. (Skogerboe - Colorado State)
W76-08540

WATERSHED SOIL DETACHMENT AND TRANSPORTATION FACTORS,
Agricultural Research Service, Morris, Minn.
C. A. Onstad, and W. C. Moldenhauer.
Journal of Environmental Quality, Vol. 4, No. 1, p 29-33, January-March 1975. 2 fig, 21 ref.

Descriptors: *Simulation analysis, Model studies, *Sediment transport, Erosion, Erosion rates, *Sediment yield, Watershed management, *Agricultural watersheds.

Quantification of sediment yields from agricultural watersheds requires that consideration be given to spatial and temporal variations in the parameters known to influence soil erosion by water. This includes accounting for variations in rainfall and runoff, the energy sources, on a storm-by-storm basis. Also to be considered are the distribution of watershed topography, soils, tillage practices, and vegetation which influence the degree of erosion or deposition. These factors are discussed with regard to simulation of the erosion-deposition continum on agricultural watersheds. (Skogerboe-Colorado State)
W76-08551

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1974,
Geological Survey, Anchorage, Alaska.
J. M. Childers, and S. H. Jones.
Open-file report, 1975. 145 p, 93 fig, 1 tab, 10 ref.

Descriptors: *Channel erosion, *Construction, *Pipelines, *Oil, *Alaska, Surveys, Aerial photography, Streams, Channel morphology, Environmental effects, Erosion control, Monitoring.
Identifiers: *Pipeline stream crossings(Alaska), Trans-Alaska Pipeline System.

Repeated site surveys and aerial photographs at 26 stream crossings along the trans-Alaska pipeline system (TAPS) route during the period 1969-74 provide chronologic records of channel changes that predate pipeline-related construction at the sites. The 1974 surveys and photographs show some of the channel changes wrought by construction of the haul road from the Yukon River to Prudhoe Bay and by construction of camps and working pads all along the pipeline route. No pipeline crossings were constructed before 1975. These records of channel changes together with flood and icing measurements are part of the U.S. Department of the Interior's continuing surveillance program to document the hydrologic aspects of the trans-Alaska pipeline and its environmental impacts. (Woodard-USGS)
W76-08559

THE PLACER RIVER SILT--AN INTERTIDAL DEPOSIT CAUSED BY THE 1964 ALASKA EARTHQUAKE,
Geological Survey, Menlo Park, Calif.
A. T. Ovenshine, D. E. Lawson, and S. R. Bartsch-Winkler.
Journal of Research of the U.S. Geological Survey, Vol 4, No 2, p 151-162, March-April 1976. 11 fig, 1 tab, 5 ref.

Descriptors: *Sedimentation, *Earthquakes, *Alaska, *Sediment transport, *Tidal waters, Silts, Movement, Erosion, Environmental effects.
Identifiers: *Anchorage area(Alaska).

At the head of Turnagain Arm near Anchorage, the major lasting geologic consequence of the Alaska earthquake of 1964 was deposition of the Placer River Silt, an intertidal deposit covering an area of more than 18 sq km and containing more than 120 cubic metres of sediment. This averages 1.5 m thick seaward of the Seward Highway and 0.9 m thick landward. Its distribution is controlled both by the arrangement of the major streams that enter tidewater and by manmade features such as the highway and railroad enbankments. The Placer River Silt is still being deposited. The contemporary lowland sedimentation system of the Portage area includes a number of depositional settings: (1) In the Placer River Silt--upper tidal flats, levees, and channelway fans, (2) elsewhere in the intertidal zone--tidal stream channels, lower tidal flats, and saltwater marsh, and (3) in the supratidal zone--gravel levees, freshwater marsh, bogs, and lakes. Since 1964, the critical environmental results of the earthquake-caused deposition have been abandonment of the settlement of Portage, formation of an unsightly blanket of silt, destruction of natural plant communities, localized erosion, and creation of quicksand hazards. (Woodard-USGS)
W76-08560

DISTRIBUTIONS OF TRANSURANIUM NUCLIDES IN SEDIMENT AND BIOTA OF THE NORTH ATLANTIC OCEAN,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W76-08602

PLUTONIUM AND AMERICIUM IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W76-08606

PROCEDURE FOR PLUTONIUM ANALYSIS OF LARGE (100 G) SOIL AND SEDIMENT SAMPLES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W76-08613

FIELD PERFORMANCE OF PERMEABLE BREAKWATER,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
For primary bibliographic entry see Field 8A.
W76-08684

ENERGY TRANSFER IN SEDIMENTARY ENVIRONMENTS: THE CASE OF SULFATOREDUCERS: I. THE ORGANIC ACIDS IN LAGOON AND MARINE SEDIMENTS (GOLFE DU LION), (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
For primary bibliographic entry see Field 5C.
W76-08718

SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
R. L. Thomas, J-M. Jaquet, A. L. W. Kemp, and C. F. M. Lewis.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 385-403, March 1976. 16 fig, 4 tab, 37 ref.

Descriptors: *Sediments, *Lake Erie, *Sediment distribution, *Lake sediments, On-site investigations, Sampling, Remote sensing, Bathymetry, Sediment sorting, Sediment-water interfaces, Silts, Sands, Clays, Carbon, Quartz, Bottom sediments, Sedimentation, Oxidation-reduction potential, Hydrogen ion concentration, Limnology, Sedimentology.
Identifiers: Sediment composition, Surficial sediments.

On the basis of extensive echosounding and grab sampling, three major units have been recognized in Lake Erie: till and bedrock, glaciolacustrine clay, and postglacial muds. These units represent the late glacial and post glacial evolution of the basin and occur in an offshore younging sequence. The main basin of the lake is subdivided by residual glacial moraines into four depositional basins: Western, Sandusky, Central, and Eastern basins. The sediment texture has been defined by moment measures (mean, standard deviation, skewness, and kurtosis), the trends of which are related to the mixing of two primary grain-size populations in the sand- and clay-size ranges. A third grain-size mode in the silt size, composed of fine quartz with some carbonate, has been recognized. This mode has a modifying effect on the symmetry of the two primary populations and may, to some extent, be sufficiently abundant to behave as a discrete population. The interrelationships of parameters indicated textural dependence on mineralogic composition, particularly important being the relationship of clay concentration to mean grain size. This has particular value in modelling the physical behavior of clay-associated geochemical elements such as phosphorus. (Sims-ISWS)
W76-08725

RATES OF ACCUMULATION OF PHOSPHORUS FORMS IN LAKE ERIE SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
J. D. H. Williams, T. P. Murphy, and T. Mayer.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 430-439, March 1976. 4 fig, 3 tab, 21 ref.

Descriptors: *Phosphorus, *Lake Erie, *Lake sediments, *Sedimentation rates, *Phosphorus compounds, *Great Lakes, Water pollution sources, Surface waters, Sedimentation, Sediments, Sediment distribution, Distribution patterns, Sediment-water interfaces, Lakes, Phosphates, Analytical techniques, Inorganic compounds, Cores, Sampling, On-site investigations, Sediment load.
Identifiers: Phosphorus forms, Phosphorus accumulation, Apatite phosphorus, Nonapatite phosphorus, Surficial sediments, Apatite.

Six Lake Erie sediment cores from locations of widely different sedimentation rates showed that rate of input and sedimentation of apatite phosphorus at a given locality has been approximately constant during the last few hundred years relative to total sedimentation rate at the same locality. Apatite is not a significant source of soluble phosphorus for Lake Erie. By contrast, rate of sedimentation of nonapatite inorganic phosphorus (NAIP) and organic phosphorus has steadily increased in accordance with increased loadings in recent years of the source material, namely phosphorus of anthropogenic origin. The rate of sedimentation of these two forms of phosphorus at a given locality varied greatly within the lake, and was greatest where the most fine-grained sediments were accumulating. It was concluded that the sediments of Lake Erie contain sufficient

orthophosphate-retaining sites to prevent major regeneration of phosphate under any conceivable condition provided the overlying water remains oxic. (Henley - ISWS)
W76-08726

CULTURAL IMPACT ON THE GEOCHEMISTRY OF SEDIMENTS IN LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
A. L. W. Kemp, R. L. Thomas, C. I. Dell, and J.-M. Jaquet.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 440-462, March 1976. 8 fig, 12 tab, 88 ref.

Descriptors: *Sediments, *Lake Erie, *Geochemistry, *Lake sediments, Sampling, Cores, Chemistry, Nutrients, Deposition(Sediments), Silts, Sedimentation rates, Sedimentation, Oxidation-reduction potential, Limnology, Sedimentology.
Identifiers: Sediment composition, Cultural effects, Sediment sources.

The chemical and physical characteristics of six cores from Lake Erie were described. The concentrations of Si, A1, K, Na, and Mg, which represent the major mineral species in the sediment, were uniform in each core. Surface enrichments of Hg, Pb, Zn, Cd, Cu, Organic-C, N, and P were observed at each location, due mainly to the increasing anthropogenic loading of these elements to the sediments since 1850. Concentration profiles for Mn, Fe, and S were related to sediment Eh and are due to mobilization of these elements in the pore waters. Natural and anthropogenic inputs of nutrients and heavy metals were calcuclated. About 60% of the total loading of these elements is being deposited in the Eastern basin. It was calculated that 30 million metric tons of fine-grained sediment accumulates in the offshore basins of the lake, each year. The major source of the sediment input is erosion of the shoreline bluffs, with the north shore between Erieau and Long Point contributing 21 million metric tons annually. A sediment mass balance suggested that a large part of this bluff material is transported up to 150 km and is deposited in the Eastern basin. (Sims - ISWS)
W76-08727

A PHYSICAL MODEL FOR THE RATE OF DEPOSITION OF FINE-GRAINED SEDIMENTS IN THE DEEP SEA,
Oregon State Univ., Corvallis. School of Oceanography.
I. N. McCave, and S. A. Swift.
Geological Society of America Bulletin, Vol. 87, No. 4, p 541-546, April 1976. 3 fig, 4 tab, 47 ref. ONR N00014-67-A-0369-0007.

Descriptors: *Model studies, *Sedimentation, *Oceans, Mathematical models, Sedimentation rates, Settling velocity, *Deposition(Sediments), Suspended solids, Particle size, Boundary layers, Turbulent boundary layers, Erosion, Silting, Sedimentology.
Identifiers: Nepheloid layer, Critical deposition conditions.

A model for the net entrapment of fine suspended sediment in the viscous sublayer of a turbulent boundary layer yielded an expression of the same form as one derived previously on an empirical basis. The expression was modified by a factor that takes into account the reduction in rate of deposition caused by occasional erosion, bottom roughness, and organic resuspension. A curve for the variation in critical deposition shear stress with particle settling velocity was constructed using the assumption that the critical deposition stress is equal to the critical erosion stress for fine noncohesive material. Application of the model to post-glacial deposition rates using modern concentration data gave reasonable agreement and suggested values of the factor little less than unity. The model involved assumption of a constant near-bed suspended sediment concentration. An alternative case of decrease in concentration with distance along the flow path showed that the grain-size modes in the deposited sediment resemble the pattern of size modes found north of the Carnegie Ridge in the Panama Basin. (Sims - ISWS)
W76-08736

DISTRIBUTION, COMPOSITION, AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE VICINITY OF WILLAPA SUBMARINE CANYON, WASHINGTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-08737

USE OF SURFACE-ACTIVE CHEMICALS IN PUMP-ASHORE SCHEMES AND SUCTION DREDGERS,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 8C.
W76-08747

2K. Chemical Processes

EVALUATION OF METHODS FOR PRESERVING THE LEVELS OF SOLUBLE INORGANIC PHOSPHORUS AND NITROGEN IN UNFILTERED WATER SAMPLES,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
For primary bibliographic entry see Field 5A.
W76-08157

AN IMPROVED METHOD FOR DETERMINATION OF THE CHEMICAL OXYGEN DEMAND WITH POTASSIUM DICHROMATE (COD-METHOD) (EINE VERBESSERTE METHODE ZUR BESTIMMUNG DES CHEMISCHEN SAUERSTOFFBEDARFS MIT KALIUM-DICHROMAT) (COD-METHODE),
For primary bibliographic entry see Field 5A.
W76-08256

MEASUREMENT METHOD FOR DISSOLVED AMMONIA NITROGEN IN WATER (YOZON ANMONIASEI CHISSO NODO SOKUTEIHO),
For primary bibliographic entry see Field 5A.
W76-08261

ABSORPTIOMETRIC DETERMINATION OF IRON WITH T.P.T.Z.,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 5A.
W76-08273

ESTIMATING WATER SALINITY WITH GEOPHYSICAL EARTH RESISTIVITY EQUIPMENT,
Agricultural Research Service, Sidney, Mon.
A. D. Halvorson, and C. A. Reule.
Soil Science Society of America Journal, Vol. 40, No. 1, p 152-153, January-February 1976. 2 fig, 1 tab, 5 ref.

Descriptors: *Conductivity, *Electrical conductance, *Resistivity, *Salinity, *Chemical properties, Chemical analysis, Analytical techniques, Analysis, Physical properties, Electrical properties, Water properties, Saline water, Saline soils, Water quality, On-site tests, Instrumentation, Equipment, Estimating, Geophysics.
Identifiers: *Solution conductivity, *Four-electrode conductivity cell, *Geophysical resistivity meter.

A procedure was described for estimating salinity of water samples in the field using a geophysical earth resistivity meter and four-electrode conductivity cell. Using field collected water samples, a linear relationship of $Y = 1.02(X) + 0.12, r = 0.996$, was obtained between EC sub 25 values determined using a commercial laboratory bridge and cell (Y), and those determined using an earth resistivity meter and an easily fabricated, four-electrode conductivity cell (X). (Henley-ISWS)
W76-08332

DETERMINATION OF TOTAL NITROGEN IN NATURAL WATERS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
D. W. Nelson, and L. E. Sommers.
Journal of Environmental Quality, Vol. 4, No. 4, p. 465-468, 1975. 6 tab., 9 ref.

Descriptors: *Analytical techniques, *Methodology, *Water analysis, *Nitrogen, Vapor compression distillation, Nitrogen compounds, *Pollutant identification.
Identifiers: Kjeldahl method.

Total nitrogen determinations in natural waters are complicated because numerous forms of nitrogen are present. Nitrates are frequently present in substantial amounts and require pretreatment to be quantitatively reduced to ammonia, which is measured by the Kjeldahl nitrogen method. Nitrate recovery from plant materials, fertilizers, and soils succeed when samples are pretreated with reduced iron in acid media. Hydrogen generated by the iron-with-acid reaction apparently acts as a reducing agent. In the proposed method water samples are evaporated and pretreated with reduced iron and sulfuric acid, followed by Kjeldahl digestion to recover organic nitrogen. Ammonia in the digestion mixture is estimated by steam distillation and titration. Nitrate and organic nitrogen recovery is affected by the brand and amount of reduced iron used and boiling the sample gently with reduced iron and sulfuric acid before digestion. The method measures up to 2 mg total nitrogen and 0.5 mg nitrate nitrogen in filtered or unfiltered river and pond waters. It is simple, precise, more rapid than other methods, and can measure all forms of nitrogen commonly found in natural and waste waters. Organic nitrogen can be calculated by subtracting inorganic nitrogen from the total nitrogen found. (Buchanan-Davidson--Wisconsin)
W76-08355

REASSESSMENT OF MERCURY IN SURFACE WATER IN THE ADIRONDACK REGION, NEW YORK,
Geological Survey, Ithaca, N.Y.
W. Buller.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 223-226, March-April 1976. 1 fig, 1 tab, 11 ref.

Descriptors: *Mercury, *Natural streams, *Water analysis, Analytical techniques, *New York, Sampling, *Pollutant identification.
Identifiers: *Adirondack region(NY), Sample preservation.

A study in 1970 established a natural background concentration of mercury in surface water in the Adirondack region of New York. In 1974, new methods of sample preservation and analysis were used in determining concentrations of mercury of samples of water from the same surface-water sites sampled in 1970-71. Concentrations of mercury for all sites in the 1974 study were virtually the same as those obtained in 1970-71, less than 0.5 microgram per litre. The analytical methods are described. (Woodard-USGS)
W76-08554

SELECTED HYDROLOGIC DATA, CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.

For primary bibliographic entry see Field 7C.
W76-08557

GEOLOGY AND WATER RESOURCES OF MARSHALL COUNTY, SOUTH DAKOTA--PART 1: GEOLOGY AND WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-08558

WATER QUALITY IN THE MAD RIVER BASIN, HUMBOLDT AND TRINITY COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-08562

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN BRAZORIA, FORT BEND, AND WALLER COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08569

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN HARRIS AND GALVESTON COUNTIES, TEXAS, 1970-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08570

REFERENCE METHODS FOR MARINE RADIOACTIVITY STUDIES II.
International Lab. of Marine Radioactivity, Vienna (Austria).
For primary bibliographic entry see Field 5A.
W76-08608

QUALITY CONTROL IN RADIOCHEMICAL ANALYSIS,
New York Operations Office (AEC), N. Y. Health and Safety Div.
For primary bibliographic entry see Field 5A.
W76-08609

ISOTOPIC ANALYSIS OF PLUTONIUM IN ENVIRONMENTAL SAMPLES BY ISOTOPE DILUTION MASS SPECTROMETRY,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W76-08612

COMPARISON OF TWO PREDICTIVE NONEQUILIBRIUM ONE-DIMENSIONAL MODELS FOR PHOSPHORUS SORPTION AND MOVEMENT THROUGH HOMOGENEOUS SOILS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-08677

THE SIGNIFICANCE AND VARIATION OF ATMOSPHERIC NUTRIENT INPUTS IN A SMALL CATCHMENT SYSTEM,
Sheffield Univ. (England), Department of Geography.
For primary bibliographic entry see Field 5A.
W76-08728

2L. Estuaries

MARINE ECOLOGY OF THE NORTHERN EUBOEA: I. PRELIMINARY DATA ON THE ZOOPLANKTON AND THE ICHTYOPLANKTON, (IN FRENCH),
Athens Univ. (Greece). Zoological Lab. and Museum.
C. Yannopoulos, and J. M. Barrois.
Biol Gallo-Hell. 6(1), p 125-133, 1975.

Descriptors: Ecology, *Zooplankton, Larvae, Europe, Marine biology, Marine animals, Plankton, *Teleasts, *Biomass, Crustaceaus, Copepods.
Identifiers: Acartia-Clausi, *Greece(Euboea gulf region), *Ichthyo plankton, Penila-Avirostris, Agean Sea.

The zooplankton (biomass, species composition) and the ichthyoplankton (larvae) were studied from samples obtained in 1974 during 5 cruises in the north Euboea gulf region (Greece). Biomass estimations presented the same low values (1.3-2.9 mg/m3) as those from the open Aegean Sea, with the exception of the Pagasitikos Gulf (near Volos) where higher values were found (17.2 mg/m3). Almost all zooplanktonic groups were found in this area. The copepod Acartia clausi dominates during spring (70%-90%) and the cladoceran Penilia avirostris during summer (74%-93%). In the ichthyoplankton, 28 spp. of teleosts were identified.--Copyright 1976, Biological Abstracts, Inc.
W76-08106

COASTAL CIRCULATION AND PHYSICAL OCEANOGRAPHY OF THE SCOTIAN SHELF AND THE GULF OF MAINE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
W. H. Sutcliffe Jr, R. H. Loucks, and K. F. Drinkwater.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 1, p 98-115, January 1976. 10 fig, 3 tab, 127 ref.

Descriptors: St. Lawrence River, *Gulfs, *Ocean currents, *Ocean circulation, *Temperature, *Salinity, Commercial fish, Mixing, Upwelling, Circulation, Water circulation, Currents(Water), Sea water, Oceanography, Coasts, Estuaries, Weather, Winds, Discharge(Water), Correlation analysis, *Canada.
Identifiers: *Gulf of St. Lawrence, *Gulf of Maine, Scotian Shelf, Bay of Fundy, Labrador Current.

Correlations between annual catch of coastal commercial species of fish and the environmental factors of sea temperatures and St. Lawrence River discharge have led to an investigation of the relationship between the latter. Examining year-to-year variability of monthly means, effects of the St. Lawrence River discharge can be traced by correlation analysis with sea temperatures to propagate from the Gulf of St. Lawrence onto the Scotian Shelf and through the Gulf of Maine at known coastal current drift speeds. Seasonal salinity and transport data support such a flow at least to a section off Halifax on the Scotian Shelf. Within the Gulf of Maine seasonal salinities do not support continuity of flow; however, possible reasons and mechanisms for this were discussed. Other factors such as local river runoff in the Gulf of Maine, Labrador Current, and large-scale weather systems were briefly considered and discussed. It was proposed that the Gulf of St. Lawrence to the Gulf of Maine inclusive be considered as an oceanographic system and events occurring in the southern part on time scales of a month or more are not independent of more northerly events. It was not interpreted that the river discharge is the driving force of such an oceanographic system but rather influences the water properties within the source region of the flow, i.e., the Gulf of St. Lawrence. Some biological implications of the Gulf of St. Lawrence to Gulf of Maine pathway were pointed out. (Bender - ISWS)
W76-08125

SURFACE CIRCULATION PATTERN IN THE GULF OF ST. LAWRENCE,
Quebec Univ., Rimouski. Dept. of Oceanography.
M. I. El-Sabh.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 1, p 124-138, January 1976. 14 fig, 1 tab, 36 ref.

Descriptors: *Ocean circulation, *Ocean currents, *Density, *Gulfs, *Upwelling, St. Lawrence River, Circulation, Water circulation, Currents(Water), Mixing, Density currents, Sea water, Nutrients, Estuaries, Oceanography, Coasts, Salinity, Temperature, Weather, Winds.
Identifiers: *Gulf of St. Lawrence, Geostrophic currents, Laurentian Channel, Gyres(Cyclonic and anticyclonic).

Using all available oceanographic data in the Gulf of St. Lawrence between 1950 and 1969, a network of average stations was formed for the months of June, July, August, November, and for the winter period. The dynamic method was applied to calculate the geostrophic circulation in the Gulf during these months based on a variable reference layer. The main features of the reference layer are the steep slope along the Gaspe coast and the existence of three depressions in the Laurentian Channel, southeast and west of Anticosti Island, and in the central region of Cabot Strait. Its depth varies from 10 to 50 m in the Magdalen Shallows to more than 300 m in part of the Laurentian Channel. The general two-way flow in all entrances to the Gulf, the existence of a permanent anticlockwise gyre west of Anticosti Island, and the Gaspe and Cape Breton currents with which are associated the highest velocities in the Gulf are the main features of the circulation pattern. The circulation patterns obtained agree with the results of synoptic observations. Cyclonic and anticyclonic gyres are common in the Gulf. A comparison of the circulation patterns obtained in this study and the results of the International Biological Programme Study of the Gulf revealed that such cyclonic and anticyclonic gyres are responsible, at least in part, for the areas of maximum primary productivity west and northeast of Anticosti Island, and for the so-called 'desert areas' in the northeastern side of the Gulf. (Bender - ISWS)
W76-08126

ON A THERMAL LAG IN THE NORTH ATLANTIC OCEAN DURING A CLIMATIC CHANGE,
Ocean-Atmosphere Research Inst., Cambridge, Mass.
I. I. Schell, and D. A. Corkum.
Journal of Physical Oceanography, Vol. 6, No. 2, p 125-129, March 1976. 12 fig, 2 tab, 12 ref. DOD F44620-72-C-0040.

Descriptors: *Air temperature, *Water temperature, *Atlantic Ocean, Europe, Temperature, Atmospheric pressure, Climatology, Oceans, Oceanography.
Identifiers: *Mediterranean Sea, *Greenland, *Thermal lag, Climatic change.

An analysis was made of (1) the annual sea-surface temperature in the Northern Atlantic; (2) the sea temperatures (0-200 m) along 33 deg 00 min E between 70 deg 30 min and 72 deg 30 min N (Kola Section) representative of the inflow of relatively warm North Atlantic water into the Barents Sea; and (3) the annual air temperatures and pressures over the northern North Atlantic, Greenland, and Europe to determine whether the ocean lags (behind) the atmosphere during a climatic change by comparing the 1951-60 decade with the preceding 1941-50 decade, and with the 1921-50 period as a whole; and the 1961-70 decade with the preceding 1951-60 decade. The results obtained showed a

decline in the air temperature with no change in the sea-surface temperature in the 1951-60 decade from the preceding 1941-50 decade, and a rise in sea-surface temperature in the 1951-60 decade over the 1921-50 period suggesting a lag in the ocean vis-a-vis the atmosphere. The results further showed a decrease in both the sea and air temperatures in 1961-70, yet with some of the areas continuing to show either an increase or no change in sea-surface temperatures as evidence of a continuing lag behind the air temperature. An analysis of the air and sea-surface temperatures of the western Mediterranean (a much smaller body of water and therefore likely to respond more quickly to a climatic change) showed a rise in both the air and sea-surface temperatures in 1951-60 over 1921-50, the rise in the sea-surface temperature being the greater. (Sims - ISWS)
W76-08127

EKMAN VEERING OBSERVED NEAR THE OCEAN BOTTOM,
Oregon State Univ., Corvallis. School of Oceanography.
P. K. Kundu.
Journal of Physical Oceanography, Vol. 6, No. 2, p 238-242, March 1976. 4 fig, 1 tab, 14 ref. NSF ID 071-0411.

Descriptors: *Ocean currents, *Coasts, *Oregon, *Pacific Ocean, Shores, Ocean circulation, Winds, Current meters, Measurement, Analytical techniques, Oceanography.
Identifiers: *Ekman veering.

It has been shown that the phase angle of the complex correlation coefficient is a good measure of the average relative angular displacement (veering) between a pair of two-dimensional vector series. The correlation coefficient between the low-frequency (omega less than 0.6 cpd) components of the current vectors at 20 m and 5 m heights from the ocean bottom at a station near the Oregon coast reveals an Ekman veering of 6 degrees. (Sims - ISWS)
W76-08129

THE BALTIC SEA--A SEMI-ENCLOSED SEA, AS SEEN BY THE HYDROLOGIST,
Swedish Natural Science Research Council, Stockholm.
M. Falkenmark, and Z. Mikulski.
Nordic Hydrology, Vol. 6, No. 3, p 115-136, 1975. 10 fig, 4 tab, 28 ref.

Descriptors: *Sea water, *Basins, *Hydrology, *Water balance, *Ecology, Freshwater, Oceanography, Pollutants, Meteorology.
Identifiers: *Baltic Sea, *Renewal, *Scandinavia, Water exchange, Oceanographers, Depth profile, Vertical water balance, Horizontal water balance.

The water renewal of the Baltic Sea, a semi-enclosed basin, was discussed from the general configuration of the water balance, the size and distribution of the individual elements, and the interrelations between them. Connections between long-term variations in the water balance and certain ecological features were stressed. International cooperation has been organized between the seven riparian countries to make possible a deepened understanding of the water renewal. Monthly data are being collected for the period 1951-1975, the responsibility for individual elements being distributed among the participating countries. (Roberts - ISWS)
W76-08130

SHOOTING MODELS FOR SALINITY AND COLIFORM,
Texas Univ. at Austin. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 5B.
W76-08134

TWO-DIMENSIONAL MATHEMATICAL WATER QUALITY MODEL,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 5B.
W76-08135

SUSPENDED MATERIAL TRANSPORT: NARRAGANSETT BAY AREA, RHODE ISLAND,
Rhode Island Univ., Kingston, Graduate School of Oceanography.
B. P. Collins.
Estuarine and Coastal Marine Science, Vol. 4, No. 1, p 33-44, January 1976. 5 fig, 1 tab, 22 ref, 1 append.

Descriptors: *Sediment transport, *Suspended load, *Circulation, *Rhode Island, Suspended solids, Estuaries, Coasts, Silts, Bays, Currents(Water), Water circulation, Particle size, On-site investigations.
Identifiers: *Circulation pattern, *Narragansett Bay(RI), Sea-bed drifters, Particle size distribution, Coastal currents.

Net circulation patterns and routes of suspended material transport in lower Narragansett Bay and its approaches were investigated utilizing sea-bed drifters, transmissometer measurements, grain size distributions, suspended material concentration data and compositional analyses. In general, seaward flowing near-surface currents carry silt through lower West and East Passages, west across the Bay mouths and then south along Point Judith Neck. Very fine silt is carried along this route with little deposition but medium silt settles toward the Bay mouths. At the entrances to Narragansett Bay, the landward-flowing direction of bottom currents is modified by coastal currents and topographic influences. Near-bottom suspended material is carried into all three Narragansett Bay passages as well as eastward and westward across the entrances. The westward setting component transports suspended matter from East and West Passage across the passage mouths, southward adjacent to Point Judith Neck and then westward into Block Island Sound. Coarse silt suspended by turbulence at East and West Passage mouths is deposited along this path in the sandy silt bed (McMaster, 1960), east of Point Judith Neck. Some of the very fine silt carried along this route may be deposited in the sandy silt bed as well as in Block Island Sound. The eastward component, influenced by the nearshore circulation in Buzzards Bay, flows along the southeastern Massachusetts coast. (Lee-ISWS)
W76-08139

THE THEORY AND APPLICATIONS OF OCEAN WAVE MEASURING SYSTEMS AT AND BELOW THE SEA SURFACE, ON THE LAND, FROM AIRCRAFT, AND FROM SPACECRAFT,
City Univ. of New York. Inst. of Oceanography.
For primary bibliographic entry see Field 7B.
W76-08145

STUDIES ON THE ANIMAL COMMUNITIES IN TWO NORTH FLORIDA SALT MARSHES. PART I. FISH COMMUNITIES,
Florida Agricultural and Mechanical Univ., Tallahassee.
C. B. Subrahmanyam, and S. H. Drake.
Bulletin of Marine Science, Vol. 25, No. 4, p. 445-465, 1975. 8 fig., 7 tab., 40 ref. USDA 216-15-03.

Descriptors: *Fish populations, *Temporal distribution, *Tidal marshes, Florida, Water temperature, Salinity, Biomass, Dominant organisms, Tributaries, Varieties, Killifishes, Tides, Juvenile fish.
Identifiers: Diversity index, St. Marks Marsh(Fla), Wakulla Marsh(Fla), Cyprinodontiform fish.

The St. Marks and Wakulla marshes, Florida, are undisturbed Juncus tidal marshes. Diversity indices calculated from seasonal fluctuations in temperature, salinity, abundance, and fish biomass in tidal creeks in each locality were used to interpret temporal changes in fish community composition. The creeks' salinities ranged from 3.9-27. 8% and temperatures 12-36C. Fifty-five fish species were caught, but seven cyprinodontiform species, Menidia beryllina, Leiostomus xanthurus, Eucinostomus argenteus, and Anchoa mitchilli were dominant. Community compositions varied with tides. The designation 'Fundulus-Menidia' community, was proposed for north Florida marsh fish populations. Abundances and biomass were greater at low tide but could not be correlated with seasonal temperatures or salinities. Temperature was negatively correlated with L. xanthurus abundance and positively with cyprinodontiform species. Salinity was positively correlated with L. xanthurus and Lagodon rhomboides. Gut contents, occurrence at low or high tides, and monthly length frequencies were used to group fish into permanent residents or species, using the marshes for nurseries, foragers, or visitors. Most species were represented by juveniles whose seasonal successions were observed. The diversity index increased with warmer temperatures and was influenced by species richness and distribution. The tidal creeks showed low species similarity in relation to tides and seasons at St. Marks and greater similarity at Wakulla. (Buchanan-Davidson--Wisconsin)
W76-08161

SESSILE ANIMALS ON TAR GLOBULES IN THE WATERS AROUND THE RYUKYU ISLANDS, (IN JAPANESE),
Tokyo Univ. (Japan). Ocean Research Inst.
T. U. Y. Kajihara, and M. Tachibana.
J Oceanogr Soc Jpn. 31(3); p 131-135, 1975.

Descriptors: Sessile algae, Tubificids, Worms, Aquatic animals, Pacific Ocean, Islands, Specific gravity.
Identifiers: Janua-Foraminosa, Lepas-Anatifera, Lepas-Pectinata, *Bryozoans, *Tubeworms, *Goose barnacles, Tar globules, *Japan(Ryuku Islands).

A large number of tar globules with sessile organisms were collected from the surface tows taken with larval nets in the waters around the Ryukyu Islands (Japan) during Nov. and Dec. 1973. Bryozoans (1 sp.), tubeworms (Serpulidae, Janua (Dexiospira) foraminosa (Moore et Bush) and goose barnacles (Lepas pectinata Spengler, L. anatifera were the most important species. Sinking of tar globules by Lepas of middle or large size was suggested from the differences in their specific gravity.--Copyright 1976, Biological Abstracts, Inc.
W76-08232

DISTRIBUTION OF CHAETOGNATHA AND BIOMASS OF THE ZOOPLANKTON IN THE WESTERN PART OF THE TROPICAL ATLANTIC, DURING JULY AND AUGUST 1968, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
L. J. Urosa, and T. S. S. Rao.
Bol Inst Oceanogr Univ Oriente Cumana. 13(1/2), p 53-66, 1974.

Descriptors: *Zooplankton, *Biomass, *Atlantic Ocean, South America, Coasts, *Distribution patterns, Seasonal, Trophical regions, Salinity, Temperature.
Identifiers: *Chaetognatha, Krohnitta-Pacifica, Pterosagitta-Draco, Sagitta-Decipiens, Sagitta-Enflata, Sagitta-Helenae, Sagitta-Hispida, Sagitta-Hexaptera, Sagitta-Minima, Sagitta-Serratodentata, Sagitta-Tenuis.

The western tropical Atlantic Ocean off the northern coast of South America is greatly influenced by the outflow of the Amazon and Orinoco Rivers, and others. The Guiana Current interacts with the freshwater outflow and brings about marked changes in the salinity and temperature conditions over the area. This results in seasonal faunistic changes. Surface plankton collections were made at 90 stations during July-Aug. 1968, on board M/N LA SALLE, using a net made of Number3 nylon--mesh .324 mm-with a mouth diameter of 50 cm. Each collection took 10 min duration and filtered approximately 45 m3 of water. The following species of chaetognaths were recorded from the area: Sagitta enflata Grassi 1881; S. serratodentata Krohn 1853; S. hispida Conant 1895; S. helenae Ritter-Zahony 1910; S. decipiens Fowler 1905; S. hexapera d'Orbigny 1834; S, minima Grassi 1881; S. tenuis Conant 1896; Krohnitta pacifica (Aida) 1897 and Pterosagitta draco (Krohn) 1853. The results obtained during July-Aug. are compared with similar work done in this area by Alvarino (1968) and Calef and Grice (1967) during Oct.-Nov. and May-June. The 4 dominant species during July-Aug. were S. enflata, S. hispida, S. serratodentata and K. pacifica. The others show irregular distribution. Zooplankton biomass-wet displacement volume-during July-Aug. showed twice the value reported by Calef and Grice (1967) for spring in the area.--Copyright 1976, Biological Abstracts, Inc.
W76-08245

ECOLOGY OF THE ZOOPLANKTON IN THE GULF OF CARIACO. PART I: VARIABILITY OF THE BIOMASS OF THE ZOOPLANKTON DURING THE PERIOD FROM AUGUST TO NOVEMBER, 1973, (IN SPANISH),
Indian Ocean Biological Centre, Cochin (India); and National Inst. of Oceanography, Cochin (India).
For primary bibliographic entry see Field 5C.
W76-08247

RESEARCH STUDIES ON THE FAUNA OF THE GREEK SUBTERRANEAN WATERS, (IN FRENCH),
C. Bou.
Biol Gallo-Hell. 6(1), p 101-115, 1975.

Descriptors: *Copepods, *Isopods, *Amphipoda, Marine animals, Groundwater, *Subsurface waters, Europe, Caves, Karst hydrology, Coasts.
Identifiers: Balcanella-petkovskii, Balcanella-vandeli, Bogidiella-longiflagellum, Bogidiella-sp., Eriopisa-sp., Graeteriella-sp., Microcharon-major, Microcharon-stygius, Microparasellus-sp., Niphargus-jovanovici, Niphargus-longicaudatus, Niphargus-skopljensis, Nitocrella-sp., Pseudocandona-spelea, Salentinella-angelieri, Sigmatidium-sp., Speocyclops-sp., *Ostrocods, *Greece.

About 40 samples, obtained in summer 1969 and 1971 in underground waters of Greece (Euboea, Peloponnesus, Cephalonia and Ionia), show an interesting underground fauna living in water sheets, rivers and in caves and karstic springs. The copepods (Speo-cyclops sp., Graeteriella sp., Nitocrella sp. and Sigmatidium sp.), ostracods (Pseudocandona aff. spelea), Isopods (Microcharon stygius, M. major, Microparasellus sp.) and Amphipods (Balcanella petkovskii, B. vandeli, Salentinella angelieri, Bogidiella longiflagellum, Bogidiella sp., Eriopisa sp., Niphargus skopljensis, N. jovanovici and N. longicaudatus).--Copyright 1976, Biological Abstracts, Inc.
W76-08296

A STUDY ON MARINE TRACE ELEMENTS AND CSK STANDARDS, (IN JAPANESE),
Sagami Chemical Research Center, Sagamihara (Japan).
K. Sugawara.
J Oceanogr Soc Jpn. 30(6), p 304-311, 1974.

Descriptors: *Trace elements, *Standards, Oceans, Sea water, Copper, Zinc, Nutrients, Pacific Ocean, Vanadium, Antimony, Arsenic, Molybedenum, *Pollutant identification.
Identifiers: CSK standards, *Japan.

Studies on trace elements in oceans are reviewed. Cu, Zn, V, Sr, As and Mo levels in seawater are compared with those of freshwater and earth materials. CSK (Cooperative Study of the Kuroshio (Japan)) standards for trace elements and other nutrients of oceans are compared with the findings of similar organizations.--Copyright 1976, Biological Abstracts, Inc.
W76-08311

PLANKTONIC ECOSYSTEMS: THE EFFECTS OF DYSTROPHIC CONDITIONS ON STRUCTURE AND FUNCTION IN THE GULF OF FOS, (IN FRENCH),
Aix-Marseille-Univ. (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 5C.
W76-08312

ORGANIC CARBON, PHOSPHORUS AND NITROGEN IN THE WATERS OF THE SEA OF JAPAN, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5A.
W76-08313

FINE-DISPERSED FRACTION OF SUSPENDED ORGANIC MATTER IN THE EAST PACIFIC WATERS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Insstitut Okeanologii.
For primary bibliographic entry see Field 5C.
W76-08314

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. VII, A HINDCAST,
New York City-Rand Inst., N.Y.
For primary bibliographic entry see Field 5B.
W76-08317

ERTS-1 INVESTIGATION OF WETLANDS ECOLOGY,
American Univ., Washington, D.C. Dept. of Biology.
R. R. Anderson, V. Carter, and J. McGinness.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-26464, $5.50 in paper copy, $2.25 in microfiche. Final Report. 106 p, 18 fig, 6 tab, 37 ref, 5 append. NASA NAS5-21752.

Descriptors: *Remote sensing, *Wetlands, *Estuaries, *Southeast US, Satellites(Artificial), Aircraft, Aerial photography, Vegetation, Coasts, Marshes, Salt marshes, Bays, Shallow water, Analytical techniques, Data processing, Classification.
Identifiers: *ERTS.

The primary goal of this study was to test the feasibility of using ERTS-1 data to provide information for studies of coastal wetland ecology. The data were analyzed with reference to four major objectives contained in the original proposal. These objectives were as follows: (1) to develop methods for delineation and mapping of wetlands plant communities and for establishment of the boundaries of the wetlands ecosystem; (2) to provide a method for identification and evaluation of wetland types for purposes of coastal zone management including preservation and maintenance of wildlife populations; (3) develop methodology for monitoring coastal wetlands on a regular basis for protection from man-made and natural reduction in productivity; and (4) develop methodology for delineation and mapping of shallow water areas. During the course of the study, the first three objectives were accomplished. The fourth objective, mapping of shallow water areas, was not accomplished because the turbidity of the coastal water in the test site appeared to be too great to pursue this objective within the time allotted. The methods used for analysis of ERTS data, the results of the analysis, and present and potential application of ERTS data to coastal wetlands were discussed. (Sims-ISWS)
W76-08319

UPDATING THE NAVY ENVIRONMENTAL PROTECTION DATA BASE TO INCORPORATE OIL SPILL CLEAN-UP PERFORMANCE,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5B.
W76-08320

GUIDELINES FOR MATERIAL PLACEMENT IN MARSH CREATION,
Center for Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 5G.
W76-08325

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY, PART II: NON-CONSERVATIVE SPECIES TRANSPORT MODELS,
Alabama Univ., Dept. of Chemical and Metallurgical Engineering.
For primary bibliographic entry see Field 5B.
W76-08327

DEVELOPMENT OF A THREE-DIMENSIONAL TIME-DEPENDENT FLOW FIELD MODEL,
Louisiana State Univ., Baton Rouge, Dept. of Chemical Engineering.
R. C. Farmer, W. R. Waldrop, F. H. Pitts, and K. R. Shah.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-24070, $5.00 in paper copy, $2.25 in microfiche. Report NASA-CR-120762, January 1975. 88 p, 6 fig, 2 tab, 9 ref, 1 append. NASA NAS8-30380.

Descriptors: *Estuaries, *Bays, *Sediment transport, *Model studies, *Alabama, Mathematical models, Computer models, Computer programs, Flow, Sea water, Freshwater, Saline water-freshwater interfaces, Winds, Rivers, Circulation, Water circulation, Fluid mechanics.
Identifiers: *Mobile Bay(Ala).

A three-dimensional, time-dependent mathematical model to represent Mobile Bay was developed. The objective of this study was to develop computer programs which would numerically solve the appropriate conservation equations for predicting bay and estuary flow fields. The model will be most useful for analyzing the dispersion of sea water into fresh water and the transport of sediment. Also, the model serves as a useful tool for relating field and physical model data. The unique feature of this model is that it correctly accounts for momentum transfer in the governing flows, thereby making it far more realistic than any previously devised. NASA's ERTS and Skylab programs resulted in high quality photographs of Mobile Bay. U.S. Army Corps of Engineers have also studied this bay extensively. All these data have been reviewed for comparison to this mathematical model. The computer program listing is contained in the appendix. (Sims-ISWS)
W76-08328

SOME THREE-DIMENSIONAL CHARACTERISTICS OF LOW-FREQUENCY CURRENT FLUCTUATIONS NEAR THE OREGON COAST,
Oregon State Univ., Corvallis. School of Oceanography.
P. K. Kundu, and J. S. Allen.

Journal of Physical Oceanography, Vol. 6, No. 2, p 181-199, March 1976. 12 fig, 7 tab, 21 ref. NSF GX-28746, GX-33502, ID071-04211.

Descriptors: *Currents(Water), *Coasts, *Oregon, *Pacific Ocean, Upwelling, Shores, Circulation, Ocean circulation, On-site data collections, On-site investigations, Oceans, Oceanography.

An analysis was presented of the low-frequency fluctuations of the currents near the Oregon coast, based on the 1972-1973 measurements from moored current meters in CUE-1 and CUE-2. U and v denoted the eastward (approximately onshore) and northward (approximately alongshore) components of the currents. The mean alongshore velocity has the structure of a baroclinic coastal jet, whose maximum speed occurs near the surface at a distance of about 15-20 km from the shore, whereas the fluctuating part of v has the structure of a roughly barotropic coastal jet whose maximum occurs very near the shore. The standard deviation of v is approximately depth-independent whereas that of u decreases with depth. As one approaches the coast, the standard deviation of u decreases whereas that of v rises steeply, consistent with the behavior expected of coastally trapped wave motion. A scatter plot of the velocity fluctuations in a hodograph plane indicates that the fluctuations roughly follow the direction of the local isobaths. The Reynolds stresses in an east-north coordinate system therefore change sign because of the change of direction of the isobaths in the region. The v fluctuations seem to be mutually better correlated than the u fluctuations throughout the region, suggesting that the u components may be affected by 'turbulence'. (Sims-ISWS)
W76-08336

A PARAMETRIC WAVE PREDICTION MODEL,
Max-Planck-Institut fuer Meteorologie, Hamburg (West Germany).
K. Hasselmann, D. B. Ross, P. Muller, and W. Sell.
Journal of Physical Oceanography, Vol. 6, No. 2, p 200-228, March 1976. 12 fig, 1 tab, 48 ref.

Descriptors: *Model studies, *Mathematical models, *Ocean waves, *Waves(Water), Numerical analysis, Equations, Computer models, Forecasting, Energy, Energy transfer, Oceanography.
Identifiers: *Wave spectra.

Measurements of fetch-limited wave spectra from various sources indicate an approximate invariance of the normalized spectral shape with fetch. It has been suggested from investigations of the spectral energy balance that this can be explained by the shape-stabilizing influence of nonlinear resonant wave-wave interactions, which are also responsible for the migration of the spectral peak to lower frequencies. Analyses of a series of further data sets obtained under non-uniform, non-stationary wind conditions show that the invariance of the spectral shape is not restricted to uniform-wind, fetch-limited situations, but applies generally for a growing wind sea. The observed shape invariance was exploited in a wave prediction model by projecting the full transport equation for the two-dimensional spectral continuum onto two variables characterizing the energy and frequency scales of the spectrum. Inspection of the resultant equations revealed further simplifications, enabling the system to be reduced to a single prediction equation for one scale variable, the peak frequency. This was feasible because of the rapid adjustment of the spectrum to a quasi-equilibrium level in which the atmospheric input is balanced by the nonlinear transfer of energy out of the central region of the spectrum to higher and lower frequencies. (Sims-ISWS)
W76-08337

NUMERICAL COMPUTATION OF TWO-DIMENSIONAL FLOWS,
Lanchester Polytechnic, Coventry (England), Dept. of Civil Engineering.
J. P. Grubert.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW1, Proceedings Paper 11891, p 1-12, February 1976. 6 fig, 9 ref, 2 append.

Descriptors: *Coastal engineering, *Estuaries, *Harbors, *Waves(Water), *Analytical techniques, Model studies, Hydraulics, Tsunamis, Seiches, Tides.
Identifiers: *Hooghly estuary(India), *Courant number, Implicit finite difference scheme.

A computational system was presented for the calculation of long waves in harbors and coastal seas. The numerical method used was a three-level implicit finite difference scheme, using the fractional steps technique. The method is as accurate as existing explicit schemes, but the implicit scheme improves in performance as the wave period increases. Computations on the Hooghly estuary have shown that the scheme is not only accurate but can be at least five times cheaper than an equivalent explicit scheme. The system has been tested with waves of a few minutes period under storm conditions. Tests on harbor under gale conditions with waves of one minute period showed that nonlinear instabilities develop, but they can be dissipated by iterating for equation coefficients. (Singh - ISWS)
W76-08341

OREGON COAST SHORELINE CHANGES DUE TO JETTIES,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 8B.
W76-08342

HYDROGEOLOGY OF THE SOUTH FORK OF LONG ISLAND, NEW YORK,
Wisconsin Univ. Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W76-08347

A SEABED DRIFTER STUDY OF NEAR-BOTTOM CIRCULATION IN NORTH CAROLINA SHELF WATERS,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
J. D. Schumacher, and B. J. Korgen.
Estuarine and Coastal Marine Science, Vol. 4, No. 2, p 207-214, March 1976. 3 fig, 1 tab, 20 ref.

Descriptors: *Drifting(Aquatic), *Estuaries, *Continental shelf, *Water circulation, *North Carolina, Coasts, On-site investigations, Circulation, Ocean circulation, Currents(Water), Inlets(Waterways), Oceanography.
Identifiers: *Seabed drifters, Raleigh Bay(NC), Onslow Bay(NC), Near-bottom currents.

Circulation within North Carolina near-bottom shelf waters was investigated between June 1972 and April 1973 using seabed drifters (SBDs). Seabed drifter trajectories revealed a tendency for onshore components of near-bottom drift in Raleigh Bay; in Onslow Bay near-bottom currents were complex, generally featuring offshore components in the northern end with a tendency for onshore components in the southern end. A divergence zone separating onshore from offshore near-bottom flow was found in Onslow Bay. The location of this zone remained constant during the duration of the study. (Sims - ISWS)
W76-08350

CHLORINATED PESTICIDES AND POLYCHLORINATED BIPHENYLS IN MARINE SPECIES, OREGON/WASHINGTON COAST, 1972,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
For primary bibliographic entry see Field 5A.
W76-08359

ROLE OF VITAMINS IN BACTERIAL-PLANKTON RELATIONSHIPS IN LITTORAL SEAWATER AND IN SUPRALITTORAL POOLS: II. ANNUAL EVOLUTION OF ORGANISMS WHICH PRODUCE VITAMIN SYNTHESIS, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5C.
W76-08405

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W76-08411

CULTURE AND GROWTH OF NORTHERN ANCHOVY, ENGRAULIS MORDAX LARVAE,
National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
J. R. Hunter.
Fishery Bulletin, Vol. 74, No. 1, p 81-88, 1976. 5 fig, 5 tab, 18 ref.

Descriptors: *Fish Physiology, *Aquaculture, Laboratory tests, *Growth rates, *Food chains, *Larval growth stage, *Fish food organisms, Dino-flagellates, Algae, Rotifers, Aquatic microorganisms, Brine shrimp, Copepods, Methodology, Growth stages, Immature growth stage, Mortality, Fish diets, Plankton, Water pollution effects.
Identifiers: Starvation, *Northern Anchovy, Engraulis mordax, Metamorphosis.

Culture techniques used to rear larval anchovy through metamorphosis using laboratory cultured foods are described. Anchovy larvae fed dinoflagellates, rotifers, harpacticoid copepods, and brine shrimp nauplii, completed metamorphosis (35 mm) in 74 days at 16C with a minimum survival of 12.5%. Growth in length and weight were recorded over this interval which correlated with the Laird-Gompertz growth equation. Growth was comparable to that on a wild plankton diet. Most of the fish that completed metamorphosis withstood a starvation period of 12-15 days, whereas those that had not completed metamorphosis did not survive. (Katz)
W76-08432

CHLORINATED HYDROCARBONS IN MESOPELAGIC FISHES OF THE EASTERN GULF OF MEXICO,
University of South Florida, St. Petersburg, Fla.
For primary bibliographic entry see Field 5C.
W76-08434

ABUNDANCE OF MACROCRUSTACEANS IN A NATURAL MARSH AND A MARSH ALTERED BY DREDGING, BULKHEADING, AND FILLING,
National Marine Fisheries Service, Galveston, Tex. Gulf Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-08435

DDT AND ITS METABOLITES IN THE SEDIMENTS OFF SOUTHERN CALIFORNIA,
National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-08436

EFFECTS OF TEMPERATURE AND SALINITY ON THE SURVIVAL OF WINTER FLOUNDER EMBRYOS,
National Marine Fisheries Service, Narragansett, R. I. Narragansett Lab.
For primary bibliographic entry see Field 5C.
W76-08437

EFFECTS OF LOW CONCENTRATIONS OF OIL ACCOMMODATED IN SEA WATER ON THE GROWTH OF UNIALGAL MARINE PHYTOPLANKTON CULTURES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W76-08440

MORTALITIES AND EPIBIOTIC FOULING OF EGGS FROM WILD POPULATIONS OF THE DUNGENESS CRAB, CANCER MAGISTER,
California Univ., Davis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5C.
W76-08444

THE PLANKTON TOWER. I. A STRUCTURE TO STUDY WATER/SEDIMENT INTERACTIONS IN ENCLOSED WATER COLUMNS,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W76-08446

THE PLANKTON TOWER. II. RELEASE OF NUTRIENTS FROM SEDIMENTS DUE TO CHANGES IN THE DENSITY OF BOTTOM WATER,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W76-08447

THE EFFECT OF HEAVY METALS ON LABORATORY POPULATIONS OF TWO POLYCHAETES WITH COMPARISONS TO THE WATER QUALITY CONDITIONS AND STANDARDS IN SOUTHERN CALIFORNIA MARINE WATERS,
California State Univ., Long Beach.
For primary bibliographic entry see Field 5C.
W76-08451

THERMAL-HYDRAULIC MODEL STUDY OF OFFSHORE DISCHARGE SYSTEM FOR KAHE POWER PLANT, HAWAII,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W76-08508

ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W76-08510

THE ROLE OF ORGANIC DETRITUS IN THE FORMATION OF DISTINCTIVE SANDY TIDAL FLAT SEDIMENTARY STRUCTURES, TAY ESTUARY, SCOTLAND,
Dundee Univ., Newport-on-Tay (Scotland). Tay Estuary Research Center.
A. T. Buller, and C. D. Green.
Estuarine and Coastal Marine Science, Vol. 4, No. 2, p 115-118, March 1976. 1 fig, 3 plates, 8 ref.

Descriptors: *Estuaries, *Sediments, *Detritus, *Organic matter, Decomposing organic matter, Organic compounds, Sands, Peat, Deposition(Sediments), Tides, Tidal waters, Tidal effects, Sedimentology.
Identifiers: *Tay Estuary(Scotland), *Scotland.

The intermittent deposition, subsequent burial and decomposition of organic detritus along part of the Tay estuary's lower sandy tidal flats produce black peatysand layers which crudely resemble sedimentary structures typical of mixed tidal flats. Erosion of some of these peaty layers by lateral creek migration results in the formation of peatysand clasts. These are organic-rich equivalents of mud clasts normally found as mud pebbles and conglomerates deposited on the bottoms of mixed tidal flat creeks. (Sims-ISWS)
W76-08524

OCEANOGRAPHIC CONDITIONS DURING 1973 IN RUSSEL FJORD, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
W. S. Reeburgh, R. D. Muench, and R. T. Cooney.
Estuarine and Coastal Marine Science, Vol. 4, No. 2, p 129-145, March 1976. 11 fig, 2 tab, 17 ref.

Descriptors: *Fjords, *Glaciers, *Water circulation, *Alaska, On-site data collections, On-site investigations, Estuaries, Coasts, Sampling, Temperature, Salinity, Oxygen, Nutrients, Bathymetry, Oceanography.
Identifiers: *Glacial damming, Russell Fjord(Alaska), Hubbard Glacier(Alaska).

Russell Fjord appears to be in the process of being dammed and isolated from marine influence by the advancing Hubbard Glacier. This study was initiated to understand the present circulation of the fjord and to provide a basis for comparison in the event that closure should occur. Observations made during 1973 indicated that the deep water is continuously renewed by near-surface source water added over the sill. 'N0', 9 N03(-) plus 02, appears to be useful in tracing these additions. The probable consequence of glacial damming were considered. (Sims-ISWS)
W76-08525

DISTRIBUTION AND MOVEMENT OF ZINC AND OTHER HEAVY METALS IN SOUTH SAN FRANCISCO BAY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-08561

PLUTONIUM IN THE AQUATIC ENVIRONMENT, ITS BEHAVIOUR, DISTRIBUTION AND SIGNIFICANCE,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5C.
W76-08599

PLUTONIUM IN ATLANTIC COASTAL ESTUARIES IN THE SOUTHEASTERN UNITED STATES OF AMERICA,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5C.
W76-08600

COMPARISON OF THE DISTRIBUTIONS IN MARINE SEDIMENTS OF THE FALLOUT DERIVED NUCLIDES FE 55 AND PU 239,240, A NEW APPROACH TO THE CHEMISTRY OF ENVIRONMENTAL RADIONUCLIDES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W76-08603

ENVIRONMENTAL AND PUBLIC HEALTH CONSEQUENCES OF THE CONTROLLED DISPOSAL OF TRANSURANIC ELEMENTS TO THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5C.
W76-08604

REFERENCE METHODS FOR MARINE RADIOACTIVITY STUDIES II.
International Lab. of Marine Radioactivity, Vienna (Austria).
For primary bibliographic entry see Field 5A.
W76-08608

PHYTOPLANKTON ENTRAINMENT STUDIES AT THE INDIAN RIVER ESTUARY, DELAWARE,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 5C.
W76-08636

ENTRAINMENT STUDIES AT TURKEY POINT ON BISCAYNE BAY: HAVE THERMAL EFFECTS AFFECTED THE PLANKTON OF BISCAYNE BAY,
Air and Water Research, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5C.
W76-08645

LABORATORY SIMULATION OF POWER PLANT EFFECTS: RESPONSE OF SOME ESTUARINE PHYTOPLANKTERS TO TIME TEMPERATURE COMBINATIONS,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5C.
W76-08646

CHLORINATED HYDROCARBON PESTICIDES AND MERCURY IN COASTAL BIOTA, PUERTO RICO AND THE U.S. VIRGIN ISLANDS--1972-74,
Georgia Univ., Brunswick. Marine Resources Extension Center.
For primary bibliographic entry see Field 5B.
W76-08683

FIELD PERFORMANCE OF PERMEABLE BREAKWATER,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
For primary bibliographic entry see Field 8A.
W76-08684

SEASONAL STUDIES ON THE RELATIVE IMPORTANCE OF DIFFERENT SIZE FRACTIONS OF PHYTOPLANKTON IN NARRAGANSETT BAY (USA),
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W76-08686

MICROBIAL ATP AND ORGANIC CARBON IN SEDIMENTS OF THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-08687

DETRITUS PRODUCTION IN COASTAL GEORGIA SALT MARSHES,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5C.
W76-08688

PHOSPHORUS FLUX AND CYCLING IN ESTUARIES,
Smithsonian Institution, Rockville, Md. Radiation Biology Lab.
For primary bibliographic entry see Field 5C.
W76-08689

CAUSES AND PROBABLY CORRECTIVES FOR OXYGEN DEPLETION FISH KILLS IN THE DICKINSON BAYOU ESTUARY: A FIELD STUDY AND SIMPLIFIED ALGAL ASSAY,
Texas Parks and Wildlife Dept., Seabrook. Seabrook Marine Lab.
For primary bibliographic entry see Field 5C.
W76-08690

NITROGEN UTILIZATION DURING SPRING BLOOMS OF MARINE PHYTOPLANKTON IN BEDFORD BASIN, NOVA SCOTIA, CANADA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-08691

ENERGY TRANSFER IN SEDIMENTARY ENVIRONMENTS: THE CASE OF SULFATOREDUCERS: I. THE ORGANIC ACIDS IN LAGOON AND MARINE SEDIMENTS (GOLFE DU LION), (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
For primary bibliographic entry see Field 5C.
W76-08718

A PHYSICAL MODEL FOR THE RATE OF DEPOSITION OF FINE-GRAINED SEDIMENTS IN THE DEEP SEA,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2J.
W76-08736

DISTRIBUTION, COMPOSITION, AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE VICINITY OF WILLAPA SUBMARINE CANYON, WASHINGTON,
Washington Univ., Seattle. Dept. of Oceanography.
E. T. Baker.
Geological Society of America Bulletin, Vol. 87, No. 4, p 625-632, April 1976. 7 fig, 2 tab, 46 ref. NSF 30537; ERDA AT 45-1-2225 TA 24.

Descriptors: *Sediment distribution, *Suspended solids, *Continental slope, *Sedimentation, *Washington, *Columbia River, Submarine canyons, Continental shelf, Sediment transport, Chemical analysis, Turbidity, Turbidity currents, Turbulent boundary layers, Measurement, Oceans, Rivers, Sedimentology.
Identifiers: *Willapa Canyon(Wash), Nepheloid layers, Light-scattering measurements.

The distribution and composition of suspended particulate matter in the waters over Willapa submarine canyon and the adjacent continental slope off the coast of Washington describe an apparently continuous bottom nepheloid layer ranging in thickness from 160 to 530 m and composed of particles supplied primarily by the nearby Columbia River. Near-bottom particulate concentrations, estimated by continuous vertical profiles of light-scattering intensity, systematically decrease from the continental shelf to the base of the slope. Within this trend, concentrations in Willapa Canyon are greater by a factor of as much as 3 than concentrations present at comparable locations on the adjacent open-slope areas. Mineralogical analysis of the suspended sediment within the bottom nepheloid layer suggests that the increased concentrations found within Willapa Canyon result from a preferential accumulation of Columbia River-derived particles relative to the surrounding open-slope areas. Montmorillonite/chlorite ratios greater than 1 characterize the Columbia River suspended load, and this ratio remains greater than 0.7 in samples from upper Willapa Canyon while decreasing to less than 0.7 in samples from the surrounding open slope and lower Willapa Canyon. The excess density provided by the intense nepheloid layer found in Willapa Canyon may be influential in generating a net downcanyon component of bottom flow such as observed in other submarine canyons. Predicted rates of net basinward transport of the bottom nepheloid layer sediments were in good agreement with long-term current measurements in other canyons. (Sims - ISWS)
W76-08737

ONE-DIMENSIONAL TEMPERATURE PREDICTIONS IN UNSTEADY FLOWS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-08738

COMPUTATION OF TIDAL FLOW IN WELL-MIXED ESTUARIES,
Washington Univ., Seattle. Dept. of Aeronautics; and Washington Univ., Seattle. Dept. of Mathematics.
C. E. Pearson, and D. F. Winter.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11990, p 367-377, March 1976. 5 fig, 11 ref, 2 append. EPA R801320.

Descriptors: *Model studies, *Tidal waters, *Estuaries, Flow, Channel flow, Channels, Fjords, Currents(Water), *Tides, Inlets(Waterways), Fourier analysis, Numerical analysis, Rivers, Hydraulics, Oceanography, Mixing.
Identifiers: *Well-mixed estuaries.

A new efficient procedure was developed for computing periodic flow in well-mixed estuaries of arbitrary geometry. A harmonic analysis was performed in which accurate representations of the nonlinear terms in the equations of motion are developed by successive approximation. At each iteration, the modal coefficients satisfy a system of first-order equations and boundary conditions which were combined in such a way as to promote algorithmic efficiency. The method was illustrated by applications to a model river estuary and to a deep inlet with a sill. Accuracy was demonstrated for the former case (where nonlinear effects are strong) by close agreement with results obtained from a time-stepping method. The method appears to be very efficient, and computation time may be less than 10% of that required by conventional time-stepping procedures. Analysis of multiple branches and networks of estuaries was also considered. (Sims-ISWS)
W76-08741

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

CONTINUED EVALUATION OF IN-SITU-FORMED CONDENSATION POLYMERS FOR REVERSE OSMOSIS MEMBRANES,
Midwest Research Inst., Minneapolis, Minn. North Star Research Div.
J. E. Cadotte, K. E. Cobian, R. H. Forester, and R. J. Peterson.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 193, $5.00 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/40, April 1976. 80 p, 13 fig, 21 tab, 21 ref.

Descriptors: *Desalination, *Membranes, *Reverse osmosis, *Porosity, Polymers, Extrusion, Sea water, Absorption.
Identifiers: *Polymer membranes, NS 100, NS 200, Aromatic-polyesters, Polyacrolein membranes, Gantrez-sorbitol membranes, *Aromatic polyester membranes, Organic rejection, Water absorption, Porous supports.

A research program was carried out on in situ-formed condensation membranes for seawater desalination that involved three parts: (1) new, exploratory membrane development, (2) further characterization studies on a previously reported membrane, NS-200, and (3) refinement of an underwater extrusion process for microporous polysulfone sheeting. Among new membrane compositions investigated were m-phenylenediamine/formaldehyde, polyacrolein-based systems, crosslinked vinyl and acrylic copolymers, poly (piperazine isophthalamide), phenolic and aromatic polyester membranes, and poly (isophthaloyl oxalamidrazone) membranes. The phenylenediamine/formaldehyde membrane, in particular, exhibited up to 44 gfd at 97 to 98.7 percent salt rejection, when tested against synthetic seawater at 1500 psig. Characterization studies on the NS-200 membrane system covered SEM microscopy, chemistry, elemental analysis, organics rejection, and resistance to biological degradation. A process for underwater extrusion of flat, microporous polysulfone sheeting was developed to the point of fabrication of 25-inch-wide material that was suitable for NS-200 fabrication. (OWRT)
W76-08116

RESEARCH ON ULTRAFILTRATION SYSTEMS UNDER SEAWATER DESALTING CONDITIONS,
Oxy Metal Industries (Intra) Inc., Santa Ana, Calif. Systems Engineering Div.
R. H. Williams, H. A. Parker-Jones, J. V. Peck, and J. L. Richardson.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 210, $5.50 in paper copy, $2.25 in microfiche. Report OWRT/S--76/41, (1976). 107 p, 4 fig, 16 tab, 7 ref, 2 append. 14-30-3295.

Descriptors: *Desalination, *Reverse osmosis, *Filtration, Sea water, *Membranes, *Pretreatment(Water), *Filters, Waste water treatment.
Identifiers: Tubular ultrafilters, Sand filters, Chlorine injection, Fouling, Colloidal silica, Membrane casting, Membrane cleaning, Polysulfone, Braided fiber glass tubes, *Ultrafiltration.

The overall technical objective of this program was to study, optimize, and evaluate tubular ultrafiltration systems under seawater desalting conditions. An experimental investigation was made of the feasibility, both technical and economic, of using tubular ultrafiltration membranes for treating seawater prior to desalination by reverse osmosis. Seawater desalination processes employing reverse osmosis membranes demand extensive pretreatment to prevent surface fouling. The common fouling materials present in seawater, such as biological organisms, colloidal silica, and organics, are difficult and costly to remove reliably with conventional clarification-filtration methods. This study demonstrated the ultrafiltration process to be a promising alternative method of pretreatment, both in terms of reliability and total operating costs. (OWRT)
W76-08117

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 1-5 MGD PLANTS, PLANTS FOR HIGH PRODUCT RECOVERY,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.

P. J. Schroeder, C. G. DeHaven, and M. E. Marwede.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 246, $9.75 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/38, October 1972. 233 p, 69 fig, 45 tab. 14-30-2802

Descriptors: *Desalination, Desalination processes, *Membrane processes, *Reverse osmosis, Brackish water, *Desalination plants, *Engineers estimates, Capital costs, Operating costs.
Identifiers: High product water recovery, Water pretreatment, Cost estimates.

A parametric engineering and economic analysis of the reverse osmosis process was performed in which capital and operating costs, based on 1972 prices, were developed for brackish water plants desalting four different feed waters with salinities of 3648, 1800, 2076 and 3475 ppm. Plants of 1, 3 and 5 MGD capacity, and 60 and 80% product water recovery, using tubular (800 psi), spiral wound (400 psi), hollow fine fiber (600 psi) and hollow fine fiber (250 psi) reverse osmosis module concepts (a total of 96 combinations) were studied. Economics of 1, 3 and 5 MGD multistage, reverse osmosis 95% product water recovery plants for each water type were also determined. (OWRT)
W76-08118

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 3-25 MGD LOW PRESSURE PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
P. J. Schroeder, C. G. DeHaven, and M. E. Marwede.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 247, $7.75 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/37, March 1973. 160 p, 35 fig, 17 tab. 14-30-2802.

Descriptors: *Desalination, Desalination processes, *Membrane processes, *Reverse osmosis, Brackish water, *Desalination plants, *Engineers estimates, Capital costs, Water costs.
Identifiers: Water pretreatment, Cost estimates, Low pressure membranes.

An engineering and economic analysis (based on 1972 prices and technology) of low pressure reverse osmosis brackish water desalting plants employing hollow fine fibers at 100 and 150 psi, and spiral wound modules at 200 and 250 psi was undertaken. Three moderate salinity brackish waters were studied; one at the lowest pressure for each module design at 50% recovery, one with the lowest pressure at 60% recovery, and the third with the highest pressure at 60% recovery. Lower cost plastic components were utilized in the designs to the maximum extent possible. Capital and operating water costs were estimated at 3, 10 and 25 MGD capacity (a total of 18 cases). (OWRT)
W76-08119

SOLID MINERAL AND REGENERANT RECOVERY FOR ION-EXCHANGE RESINS,
Aerojet-General Corp., El Monte, Calif. (Assignee).
D. O. DePree.
U.S. Patent No. 3,941,693, 16 p, 9 fig, 13 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 338, March 2, 1976.

Descriptors: *Patents, Water pollution control, *Water pollution treatment, *Chemical wastes, *Demineralization, *Ion exchange, Industrial wastes, Cation exchange, Anion exchange, Resins, Separation techniques, Waste water treatment.
Identifiers: Deionization, Mineral salts, Regeneration.

A basic spent cation regenerant is combined with an acidic spent anion regenerant to form a weak dissociable complex of the regenerants and to reconstitute the mineral salt. The spent cation and anion regenerants are combined either in a continuous or batch fashion by blending near stoichiometric quantities of the materials. This stoichiometric adjustment is based on the amount of the two streams necessary to reconstitute the mineral salts to be removed from the ion-exchange resins. The regenerant streams may be either aqueous solutions or organic solvent water solutions. In either case, the regenerant streams are diluted by the amount of water of solvation released by the resin during regeneration and possibly by washes of the resin beds. This additional water is removed prior, during or after separation of the regenerants depending on the nature of the separation technique employed. Separation and recovery of the free-base forms of the regenerants may be accomplished by the following: distillation of a more volatile regenerant from a relatively non-volatile regenerant; solvent extraction using an immiscible solvent having preferential solubility for one of the regenerants; or by forming an insoluble complex of one of the regenerants. The recovered regenerants are adjusted in concentration and recycled to regenerate the spent anion and cation resins and the precipitated mineral salts are separated by filtration, sedimentation, or centrifugation. (Sinha - OEIS)
W76-08199

ION-EXCHANGE GROUP BEARING COMPOSITE MEMBRANES,
Kanegafuchi Kagaku Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
S. Imai, T. Eguchi, and M. Shimokawa.
U.S. Patent No. 3,945,927, 6 p, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1908, March 23, 1976.

Descriptors: *Patents, *Waste water treatment, Water quality control, *Separation techniques, *Membrane processes, Desalination processes, Semipermeable membranes, *Ion exchange, Thin films, Coatings, *Membranes.
Identifiers: Composite membranes.

Composite membranes bearing ion-exchange groups suitable for use in membrane separation processes are produced by providing a microporous polymer membrane which is physically semipermeable, and forming a thin layer having ion-exchange groups adjacent the microporous polymer membrane. The microporous polymer membrane used for the substrate of the composite membrane is a selectively permeable film or layer of a film-forming polymer which is itself suitable for use in membrane separations such as ultra-filtration. The substrate membrane must have a number of continuous micropores through which molecules or ions smaller than the pore size can selectively be permeated. The composite membrane may be produced by coating the substrate membrane with a layer of a coating composition comprising a solution or emulsion of a film-forming polymer having reactive sites or groups into which ion-exchange groups can be introduced, removing the solvent or dispersion medium of the coating to provide a ultrathin membrane of the polymer having a thickness less than 10 microns, and introducing the ion-exchange groups into the molecules of the polymer. (Sinha - OEIS)
W76-08211

DEVELOPMENT OF ASSYMMETRIC CELLULOSE TRIACETATE MEMBRANES FOR SEA-WATER DESALINATION,
Universal Oil Products Co., San Diego, Calif. Fluid Systems Div.
J. E. Beckman, R. L. Fox, and S. S. Kremen.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 440, $6.75 in paper copy, $2.25 in microfiche. Research and Technology, Report OWRT/S--76/45, September 30, 1975. 153 p, 43 fig, 52 tab, 1 ref, append. 14-30-3273

Descriptors: *Desalination, Desalination processes, *Reverse osmosis, *Membrane processes, Sea water, *Membranes.
Identifiers: *Cellulose triacetate membranes, Spiral wound modules.

This program represented a continuation of previous work which showed that cellulose triacetate (CTA), with acetyl content in the range of 43% to 44%, should have the required long-term salt rejection capability needed for single stage sea water demineralization. Initially, problems with initial flux and rate of flux decline under reasonable pressure conditions were encountered with the use of CTA. Improvements in membrane fabrication techniques resulted in increased reproducibility which was accompanied by significant increases in membrane compaction resistance and in product flux. At the start of the program, the 10,000 hour flux value at 1000 psig and 30% recovery on sea water was estimated at 3.6 gal/ft2/day (gfd), with a compaction slope (m) equal to -0.17. At the end of the program, the flux value was estimated to be 5.8 gfd and the m value to be approximately -0.08, based on a combination of bench and field installation tests. These resuls demonstrate both the overall improvement in membrane performance and the physical integrity of the spiral elements fabricated for the high pressure application to sea water desalination. (OWRT)
W76-08283

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS SEA WATER DESALTING PLANTS, DESIGN OF 1-10 MGD SEAWATER PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
P. J. Schroeder, C. G. DeHaven, and M. E. Marwede.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 454, $9.00 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/39, March 1973. 207 p, 20 fig, 25 tab. 14-30-2802.

Descriptors: *Desalination plants, Desalination processes, *Membrane processes, *Reverse osmosis, Sea water, *Engineers estimates, Costs, Capital costs, Water costs.
Identifiers: Sea water pretreatment, Cost estimates.

An engineering and economic analysis of the reverse osmosis process for desalting sea water was performed in which capital and water costs, based on 1972 prices and technology, were developed for single and two-pass plants using hollow fine fiber, spiral wound and tubular modules. Single pass tubular plants were considered at two pressure levels. Costs for each plant were estimated at 1, 5 and 10 MGD capacity (a total of 21 cases). (OWRT)
W76-08284

DENSE EFFLUENT DISPERSION IN A STREAM,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W76-08316

COMMERCIAL MEMBRANE DESALTING PLANTS: DATA AND ANALYSIS,
DSS Engineers, Inc., Ft. Lauderdale, Florida.
C. D. Hornburg, O. J. Morin, Jr., and G. K. Hart.

Available from the National Technical Service, Springfield, Va., 22161 as PB-253 490 $10.75 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/46, September 1975. 335 p, 95 fig, 54 tab. DOI 14-30-3276.

Descriptors: *Desalination plants, *Desalination processes, *Reverse osmosis, *Electrodialysis, Membrane processes, Brackish water, Water treatment, Treatment facilities, *Operating costs, *Operation and maintenance, Virgin Islands, Florida, Wyoming.
Identifiers: Gillette(Wyoming), Siesta Key(Florida), Sanibel Island(Florida), Key Largo(Florida), Rotunda West(Florida), Grand Bahama Island, Sorrento Shores(Florida).

Eleven commercial membrane desalting plants ranging in size from 2500 GPD to 2.0 MGD were surveyed. They included four electrodialysis and seven reverse osmosis plants. Background information is presented covering water demand growth and plant history. Design documentation includes piping diagrams, flowsheets and plant layouts as well as equipment specifications. Emphasis is placed on operating experience and problems including brackish water supply and pretreatment, membrane scaling and fouling, equipment and material failures, and field modifications. Information on six of the larger plants includes performance and production cost analyses over extended operating periods. Specific conclusions are drawn and recommendations made for each plant in report sections 2 through 9. Section 1 summarizes and compares the design and performance of all the plants and contains general conclusions and recommendations. (OWRT)
W76-08370

FIELD EVALUATION TESTING OF REVERSE OSMOSIS HIGH PRESSURE PUMPS AND ENERGY RECOVERY TURBINES.
Catalytic, Inc., Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 532, $6.00 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/42, April 1973. 133 p, 64 fig, 9 tab. 14-30-3077.

Descriptors: *Desalination, Desalination processes, *Membrane processes, *Reverse osmosis, *Pump testing, *Hydraulic turbines, Centrifugal pumps, Pelton turbines.
Identifiers: Energy recovery, Torque sensors, Roswell, New Mexico, High pressure pump test loops.

Presented are evaluations of one triplex positive displacement pump, one horizontal centrifugal, and one vetical centrifugal pump on brackish water, as well as one horizontal centrifugal pump on simulated sea water at conditions expected to be encountered in reverse osmosis plants. Start-up of the pump test loops and data accumulation began in December 1971. This report covers the period from April 1, 1972 until April 15, 1973 when the pump loops were dismantled. With the exception of the triplex unit, the pumps performed in a satisfactory manner. The triplex horizontal plunger pump had the highest operating efficiency, but the lowest on-stream factor because of failures of the ceramic coated plungers. All pumps were within 3% of the manufacturer's efficiency ratings although none met the published figures. With the exception of the failure of composite parts, the centrifugal pumps performed well. Other problems incurred with the three centrifugal pumps arose mainly from associated equipment and power recovery turbine failures. The power recovery units never met, and rarely approached, their expected efficiency. (OWRT)
W76-08372

DEVELOPMENT OF REVERSE OSMOSIS MEMBRANES AND SPIRAL DESIGN MODULES FOR DEMINERALIZATION OF BRACKISH WATERS AT LOW PRESSURES,
Gulf Environmental Systems Co., San Diego, Calif.
G. E. Foreman, C. R. Mungle, S. S. Kremen, and W. W. Wright.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 566, $5.00 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/44, August 20, 1973. 76 p, 16 fig, 19 tab, 1 ref. 14-30-2853 and 14-30-3006.

Descriptors: *Desalination, Desalination processes, *Reverse osmosis, *Membrane processes, Brackish water, *Membranes.
Identifiers: *Low pressure membranes, Spiral wound modules, Cellulose acetate membranes.

Part 1 describes work directed toward the development of a low-pressure membrane for the desalination of brackish waters. The membranes developed are capable of producing between 20 and 25 gallons of permeate per square foot of membrane area per day with with an 85% rejection of chloride ion when tested on a feedwater of 3500 mg/1 sodium chloride and at feed pressure of 300 psig. Part 2 describes work directed toward manufacturing fabric-supported membranes and incorporating these into spiral wound reverse osmosis membrane elements. The elements fabricated with this membrane/fabric composite were capable of water flux rates between 14 and 20 gal/ft2/day with chloride ion rejections between 80% and 60% and magnesium ion rejection in excess of 95% when tested at 200 psig on a feedwater containing 2000 mg/1 sodium chloride and 1000 mg/1 magnesium sulfate. (OWRT)
W76-08373

DESALTING HANDBOOK FOR PLANNERS.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 755, $9.75 in paper copy, $2.25 in microfiche. OWRT/S--76/47-First Edition, May 1972. 315 p, 88 fig, 9 tab, 49 ref.

Descriptors: Desalination plants, *Desalination processes, Water supply, Water costs, Economics, *Planning, Evaluation, *Research and development, Distillation, Flash distillation, Electrodialysis, Reverse osmosos, Freezing, Ion exchange, Pre-treatment(Water), *Estimated costs, *Design criteria, Construction, Waste water treatment.

This Handbook is a compendium of information resulting from the Office of Saline Water (OSW) desalting program. Major sources of data include published reports of: (1) research and development, (2) potential applications, and (3) process economics by various OSW contractors and cooperators. Reference to these sources are included in the Handbook. Under sponsorship of the OSW Desalting Feasibility and Economic Studies Staff, the Bureau of Reclamation has compiled and organized the data together with background information and input from OSW in a form suitable for water planners' use. The Handbook has been prepared for use in preliminary planning as a source of up-to-date information on the state of development, costs, economics, and applicability of those desalting processes which are available for providing water supply. It is anticipated that the Handbook will fill a particular need in conducting Western U. S. Water Plan Studies. The Handbook is not meant to substitute for the thorough engineering and economic analysis that should precede the decision to build a desalting plant.
W76-08584

3B. Water Yield Improvement

EFFECTS OF PINYON-JUNIPER REMOVAL ON NATURAL RESOURCE PRODUCTS AND USES IN ARIZONA,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-08108

MULTIPLE USE EVALUATIONS ON PONDEROSA PINE FOREST LAND,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-08109

PINYON-JUNIPER CONTROL--DOES IT PAY,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-08110

RESEARCH AND DEVELOPMENT OF AN AIRBORNE HYGROSCOPIC SPRAY SYSTEM,
Mee Industries, Inc., Rosemead, Calif.
T. R. Mee.
Report 76-1, April 1976. 53 p, 19 fig. Bur Reclam 14-06-D-7634.

Descriptors: Research and Development, Cloud physics, *Cloud seeding, Distribution, Weather modification.
Identifiers: Airborne spray system, Atomization, Atomizers, Ammonium nitrate-urea.

Three different atomization techniques: direct pressure nozzles, air jet nozzles and spinning cylinder devices, were investigated to determine which would be most suitable for development into an airborne hygroscopic spray system. The system was to be capable of producing controlled droplet spectrums ranging from 20um MMD to 200um MMD, of an ammonium nitrate-urea solution to be used as a hygroscopic seeding material. The system was to be capable of atomizing the solution at rates of 2 liters per second. Tests were conducted under static no wind conditions and in a 110 m/s air stream. The most suitable atomization device was a direct pressure impaction type nozzle. A prototype airborne spray system has been designed using this type of nozzle. (Bureau of Reclamatin)
W76-08111

PARTICLE VAPORIZER,
Department of the Navy, Washington, D.C.
I. Koff.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-D000 630, $4.50 in paper copy, $2.25 in microfiche. Navy Case No. 55214, June 27, 1974. 6 p, 1 fig.

Descriptors: *Weather modification, *Cloud seeding, *Weather, *Artificial precipitation, *Climatology, Meteorology, Climatic data, Clouds, Rain, Snow, Precipitation(Atmospheric), Artificial storms, Cloud physics, Water shortage, Gases, Water supply, Physical properties, Nucleation, Equipment, Silver iodide, Solvents.
Identifiers: *Particle vaporizer, Weather modification nuclei, Cloud seeding apparatus, Weather modification apparatus, Invention, Vaporizer, Blower, Feed hopper, Heated tube, Flammable solvent, Dry particles, Weather modification material.

A method was described for dispersing weather modification nuclei. The government-owned invention, Serial No. 483,862, is available for licensing. The apparatus consists of a blower and a feed hopper which houses the dry particles of weather modification material. The dry material is

fed into the stream of gas coming from the blower into a dusting chamber where the particles are separated, then pass into a heated tube where they are vaporized. The vapor is then dispersed into the atmosphere and forms weather modification nuclei. (Henley-ISWS)
W76-08148

DESIGN OF AN EXPERIMENT TO SUPPRESS HAIL IN ILLINOIS,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr., and G. M. Morgan, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-253 446, $7.75 in paper copy, $2.25 in microfiche. ISWS Bulletin 61, 1976. 194 p, 48 fig, 36 tab, 101 ref, 6 append. NSF GI-37859, ERT73-0770.

Descriptors: *Hail, *Weather modification, *Cloud seeding, *Project planning, *Illinois, Agriculture, Networks, Sampling, Radar, Projects, Project benefits, Economics, Social aspects, Forecasting, Surveys, Evaluation, Climatology, Cloud physics, Meteorology.
Identifiers: *Hail suppression, Severe weather.

This final report for a 2 1/2-year project presented an optimum design for a hail suppression experiment in Illinois. the design was based on 9 years of hail research geared to hail modification planning. Studies of 3-cm and 10-cm radars, surface hail measurements, weather analysis and objective forecasting techniques, aircraft measurements of cloud properties, seeding technologies, and evaluation techniques were reviewed in detail. The hail suppression experiment design included the modification hypothesis and related seeding technologies, the statistical-physical design and evaluation, operational requirements, and impact monitoring and public interaction efforts. The advisability of conducting such an experiment at this time was discussed. (Sims-ISWS)
W76-08330

FIRST-YEAR WATER YIELD INCREASE AFTER FOREST CUTTING: AN ALTERNATIVE MODEL,
Forest Service (USDA), Athens, Ga. Forestry Sciences Lab.
For primary bibliographic entry see Field 4C.
W76-08362

WATER YIELD IMPROVEMENT BY VEGETATION MANAGEMENT: FOCUS ON ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. F. Ffolliott, and D. B. Thorud.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 055, $28.25 in paper copy, $2.25 in microfiche. College of Agriculture, Report UA/SRNR-75-01, 1975, 1,048 p. OWRT A-042-ARIZ (10) US For. Ser. 16/257/CA; OWRT 14-31-0001-3803.

Descriptors: *Water yield improvement, Water resources, Surface waters, *Forest management, *Watersheds(Basins), Snowmelt, *Arizona, Vegetation, *Runoff, Pine trees, Watershed management, *Land use, Fir trees, *Vegetation establishment, Bibliographies, Reviews.
Identifiers: *Vegetation management.

This assessment of the potentials for increasing water yield in Arizona by means of vegetation management is based on a review of the Arizona Watershed Program, which began in 1957. A summary of research is provided for: alpine vegetation zone, mixed conifer forests, aspen forests, ponderosa pine forests, pinyon-juniper woodlands, chaparral vegetation zone, grassland vegetation zone, desert shrub vegetation zone, and riparian association zone. Some of the topics covered are vegetation, climatic, edaphic, physiographic, and wildlife and fisheries characteristics and treatment effects on water yield, water quality, forage, and timber production. An estimate is made for water yield results if mixed conifer forests, ponderosa pine forests, and chaparral vegetation zones were treated at different intensities, for each of 15 basins in Arizona. These estimates have a hypothetical structure and are presented for demonstrating the upper potentials for water yield improvement, according to research results from experimental watersheds. Bibliographies follow each of the chapters on vegetation types.
W76-08539

WATER USE BY SALTCEDAR AS MEASURED BY THE WATER BUDGET METHOD,
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 2D.
W76-08573

THE RESPONSES OF SOILS AND SOIL MICROORGANISMS TO SILVER IODIDE WEATHER MODIFICATION AGENTS,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 2G.
W76-08670

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 2B.
W76-08694

3C. Use Of Water Of Impaired Quality

A COMPARATIVE STUDY OF THE EFFECT OF QUALITIES OF IRRIGATION WATER ON DIFFERENT SOILS,
Udaipur Univ. (India). Coll. of Agriculture.
P. Lal, and K. S. Singh.
J Indian Soc Soil Sci. 22(1), p 19-25, 1974.

Descriptors: *Wheat, *Soils, *Irrigation water, Fertilization, Electrical conductance, Adsorption, Salts, Clays, Hydraulic conductivity.
Identifiers: *Sodium adsorption ratio.

Pot experiments using different types of soils, irrigation waters and fertilizer levels were carried out with wheat. With waters of similar EC (electrical conductivity) values, the accumulation of salts in the soil increased with an increase in the clay and with increasing SAR (sodium adsorption ratio) of waters. SAR, ESP (exchangeable sodium percentage) and pH of soils were closely related to the SAR of irrigation water. ESP increased with an increase in salt concentration of irrigation water and SAR of the soil pH value decreased with a rise in clay percentage of the soil. Hydraulic conductivity decreased with an increase in SAR of irrigation water, while it increased with increasing salt concentration of water. An increase in clay resulted in reduced hydraulic conductivity.--Copyright 1975, Biological Abstracts, Inc.
W76-08301

SALT AND WATER BALANCE IN IMPERIAL VALLEY, CALIFORNIA,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
M. T. Kaddah, and J. D. Rhoades.
Soil Science Society of America Journal, Vol. 40, No. 1, p 93-100, January-February 1976. 4 fig, 2 tab, 13 ref.

Descriptors: *Water balance, *Soil management, Water management(Applied), Conservation, *Irrigation effects, *Irrigation practices, *California, Management, Watershed management, Irrigation systems, Salinity, Chemical properties, Irrigation water, Soil chemical properties, Water quality, Irrigation, Surface runoff, Groundwater, Root zone, Effluents, Irrigated land, *Salt balance, Inflow.
Identifiers: *Salinity trends, *Imperial Valley(Calif), Dissolved salts, Salt balance index, Soil salinity, Cropping, Water use patterns.

Salt balance of the Imperial Valley (IV) has been determined annually since 1943 by the Imperial Irrigation District. Salinity trends in the valley are assessed from biweekly measurements of the volume, V, and concentration, C, of influent, inf.w, and effluent, eff.w, waters. In this paper, the SB data were summarized, their significance was evaluated, and approaches for assessing salinity trends in the soils of the valley were suggested. The SB data reflected the cropping and water use patterns in the valley. However, the data were insufficient to distinguish origin of water and salt in effluent waters or to provide information about changes in root zone salinity. In 1973 total evapotranspiration (ET) by crops in the valley was estimated to be 229,000 ha-m, equivalent to 70% of the water delivered to the farmers. Deductions as to C1(-) composition of influent and effluent during 1973 suggested that the C1(-) load in the effluent water was contributed as follows: 54.7% from groundwater, 35.0% from root zone drainage water, and 10.3% from tail water (runoff). A more definitive interpretation of the salt balance data would require more accurate evaluation of volume of tail and consumptive use waters and volume and concentration of root zone percolate. If this information cannot be obtained on a valley-wide basis, then an alternative approach is to establish a representative number of soil salinity monitoring plots through the valley and assess their root zone salinity periodically. (Henley-ISWS)
W76-08331

ESTIMATING WATER SALINITY WITH GEOPHYSICAL EARTH RESISTIVITY EQUIPMENT,
Agricultural Research Service, Sidney, Mon.
For primary bibliographic entry see Field 2K.
W76-08332

RATE OF CHLORIDE AND WATER MOVEMENT IN SOUTHERN CALIFORNIA SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W76-08545

TRICKLE IRRIGATION WITH WATER OF DIFFERENT SALINITY LEVELS,
Guyton (William F.) and Associates, Austin, Tex.
W. J. Seifert, Jr, E. A. Hiler, and T. A. Howell.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 1, p 89-94, January-February 1975. 8 fig, 2 tab, 16 ref.

Descriptors: *Salinity, *Saline water, Irrigation, *Irrigation effects, *Sorghum, Surface irrigation, Lysimeter, Leaching, Crop response.
Identifiers: *Trickle irrigation, *Drip irrigation.

Objectives were (a) to determine effects of different concentrations of saline water on grain sorghum production and soil environment using trickle irrigation, and (b) to evaluate effects of irrigation water at one electrolyte concentration with both surface and trickle irrigation. The study was conducted in a sheltered lysimeter installation during two successive seasons. A Norwood silt loam soil was utilized in the lysimeters. Salts were purposely not leached between seasons so that salinity buildup effects could be evaluated. Numerous crop, soil and meteorological parameters were measured and evaluated to quantify effects of various treatments on the crop and soil. (Skogerboe-Colorado State)
W76-08550

CALCULATED DRAINAGE WATER COMPOSITIONS AND SALT BURDENS RESULTING FROM IRRIGATION WITH RIVER WATERS IN THE WESTERN UNITED STATES,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 5B.
W76-08671

3D. Conservation In Domestic and Municipal Use

RESIDENTIAL WATER CONSERVATION,
California Univ., Los Angeles. School of Architecture and Urban Planning.
M. Milne.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 253, $12.00 in paper copy, $2.25 in microfiche. Report No. 35, California Water Resources Center, March 1976. 468 p. 250 ref. (California Water Resources Center Project UCAL-WRC-W-424). OWRT-A-048-CAL(1).

Descriptors: *Water conservation, *Domestic water, *Water consumption, Plumbing, Economics, Attitudes, Social aspects, Motivation, Domestic water, Water utilization.

A non-technical report is presented for homeowners, builders, developers, architects, planners, utility company managers, plumbingware manufacturers, and lawmakers who are seeking ways to reduce residential water consumption. A'typical' residential consumption profile is presented, along with a brief history of how water has been used in the home. Water conservation is not simply a matter of inventing new fixtures; four types of constraints must be satisfied before any innovation in water conservation can be implemented: economic, institutional, sociocultural, and technological. The impact of each of these factors is discussed. Over four dozen commercially available devices which affect water consumption in the home are evaluated. In an attempt to discover future trends, a survey was made of the relevant aerospace technology, including Apollo and Skylab systems, as well as the systems installed in commercial jet aircraft, trains, and ships. Recent patent applications were searched and dozens of new water-conserving fixtures and appliances were discovered. Four scenarios are laid out to show the homeowner different strategies for reducing water consumption. A series of recommendations is made defining specific actions that can be taken by utility companies, lawmakers, and plumbingware manufacturers to reduce residential water consumption. The Appendix contains a 250-item annotated bibilography and a directory of manufacturers. The only alternative to continually increasing the supply of water is to reduce the demand. This report explains the various ways that can be done. (Snyder-California,Davis)
W76-08103

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, CONSTRUCTION GRANTS.
Touche, Ross and Co., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08194

AN ANALYSIS OF U. S. ENVIRONMENTAL PROTECTION AGENCY'S NEEDS SURVEY,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-08195

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, URBAN RUNOFF.
Black, Crow and Eidsness, Ind., Atlanta, Ga.; and Jordan, Jones and Goulding, Inc. Atlanta, Ga.
For primary bibliographic entry see Field 5G.
W76-08222

DEVELOPMENT OF STORM DRAINAGE COST FUNCTIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg, and J. P. O'Hearn.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. HY4, Proceedings paper No. 12069, p 515-526, April 1976. 9 fig, 6 tab, 26 equ, 7 ref. OWRT B-086-Colo(3)

Descriptors: Water resources, *Planning, *Flood control, Economics, Hydraulics, *Costs, *Estimating, Equations, Systems analysis, Hydrology, Engineering, *Design criteria, Sewers, Networks, *Storm drains, *Urban drainage.
Identifiers: Urban development, Cost estimates, Cost functions.

Planners must have simple quantitative relationships to rapidly but accurately estimate the costs of urban drainage facilities. Using fundamental concepts of urban hydrology, engineering design, and cost estimation, relationships are derived between percent imperviousness of urban areas, return period of design storm, and the resulting cost of drainage facilities. Increasing design return periods demand greater storm sewer sizes and additional coverage of drainage basins by the sewer network. A case study demonstrates rapid increases in cost from 1-year to 10-year return periods, but reduced rates of increase from 10-year to 100-year designs. The relationships developed will be useful for tradeoff decisions between levels of urbanization, storm drain design criteria, and the resulting cost of facilities. (Bell-Cornell)
W76-08227

MEASURING WATERSHED LAND-USE CHANGES WITH AIRPHOTOS,
Clemson Univ., S. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-08229

THE WATER SUPPLY SYSTEM OF A LARGE URBAN AGGLOMERATION IN SWITZERLAND (DIE WASSERVERSOWGUNG EINER SCHWEIZERISCHEN GROSS-AGGLOMERATION),
For primary bibliographic entry see Field 5F.
W76-08233

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III - VOLUME 1--DRY WEATHER FLOWS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-08278

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 2, IMPACTS OF DUST STORMS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08279

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 3 - ANALYSIS OF FLOW MODELS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08280

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 4 - PROJECT SUMMARY,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-08281

URBAN HYDROLOGY FOR SMALL WATERSHEDS.
Soil Conservation Service, Upper Darby, Pa. Engineering Div.
For primary bibliographic entry see Field 4D.
W76-08509

NONPARAMETRIC STATISTICAL ANALYSIS OF ANNUAL PEAK FLOW DATA FROM A RECENTLY URBANIZED WATERSHED,
Mount Rogers Planning District Commission, Marion, Va.
For primary bibliographic entry see Field 4C.
W76-08522

THERMAL SCANNER MEASUREMENTS OF CROP TEMPERATURES TO ESTIMATE EVAPOTRANSPIRATION,
For primary bibliographic entry see Field 2D.
W76-08591

RESOURCE RECOVERY: POSSIBILITIES AND PITFALLS,
International City Management Association, Washington, D.C. Management Development Center.
For primary bibliographic entry see Field 5D.
W76-08692

3E. Conservation In Industry

UTILISATION OF BLOOD,
Agricultural Research Council, Langford (England). Meat Research Inst.
J. M. Akers.
Food Manufacture, p 31-32. April, 1973, 9 ref.

Descriptors: *Food Processing Industry, *By-products, Waste water treatment, Industrial wastes.
Identifiers: *Meat packing wastes, *Blood recovery, Blood preservation, Economic potential.

Large quantities of blood wasted from abattoirs represent a big loss of valuable protein. By improving collection and preservation methods and by proper organization of supply and demand, marketing of blood for use in human and animal foods could be commercially viable. An improved collection method includes use of a hollow sticking knife recently patented in Germany, incorporating anticoagulant feeds into the head of the sticking knife, and total enclosure of the system to prevent the introduction of contaminants. This system results in blood recovery of 30 to 40 percent over open pan methods. Methods of preservation include addition of sodium metabisulfite, urea, or ammonia as stabilizers. The use of ammonia as a preservative in conjunction with a polyphosphate type of anticoagulant permits up to 1.5 days unrefrigerated storage of the blood before it is processed into dried separated plasma and red cells. Conclusions are: 1. improvement of hollow bleeding knives can be expected, 2. the process of separation of plasma has been highly developed, 3. to be economically viable, large plants collecting blood from several slaughterhouses will be required, and 4. markets for plasma and red blood cell debris must be established. (EPA - Corvallis)
W76-08166

DUCK-PROCESSING WASTE,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
G. L. Morris.
U. S. Dept HEW Environmental Health Series-Water Supply & Pollution Control. Public Health Service Publication No. 999-WP-31, July 1965. 13 p, 6 tab, 5 ref.

Descriptors: *Food processing industry, Industrial wastes, Industrial water, Water consumption, Wastes, Coliforms, *Treatment facilities, Water utilization, New York, Waste water treatment.
Identifiers: *Duck-processing industry, *Poultry processing industry, Wastewater characterization, Waste load, Long Island(NY).

Two duck-processing plants located on Long Island were studied to obtain waste load and water use data for comparison with chicken processing data. Weighted averages for both plants studied indicate water use of 23.6 gallons and waste loads of 0.0419 pound BOD and 0.0289 pound of suspended solids per duck processed. Similar values for chicken processing are 8 gallons of water 0.025 pound of BOD, and 0.013 pound of suspended solids per bird. Comparisons between duck and chicken processing on the basis of 1000 pounds of live birds indicate water usage is 3,600 gallons for ducks and 2,300 gallons for chickens; BOD values are 6.4 pounds for ducks and 7.18 pounds for chickens; and suspended solids values are 28.9 pounds for ducks and 13 pounds for chickens. Wastewater coliform values were 56,800 per 100 milliliter in plant A and 49,200 per 100 milliliter in plant B. (EPA-Corvallis)
W76-08168

EGG-PROCESSING PLANT WASTES,
South Dakota State Univ., Brookings.
J. R. Schultz, J. N. Dornbush, and D. A. Rollag.
Presented at 30th Annual Purdue Industrial Waste Conference Purdue University, West Lafayette, IN, May 6-8 1975. 26 p, 1 fig, 8 tab, 4 ref.

Descriptors: *Food processing industry, Waste identification, Water consumption, Industrial water, Industrial wastes, *Waste water treatment, Treatment facilities, Nebraska, Treatment facilities.
Identifiers: *Egg grading, Breaking, Processing plants, Waste water characterization, Waste water volume, Waste water reduction, Product recovery.

The investigations described provide information concerning the characteristics and volume of liquid waste resulting from the processing of eggs. The studies were conducted at the Milton G. Waldbaum plant, Wakefield, Nebraska. Over one million cases of eggs are processed at the plant each year. Processing operations include the washing, grading, breaking, and drying of eggs. The characteristics and volume of waste streams from individual processing operations and 24-hour composites of the overall plant waste were obtained and are reported. Using raw product input and wastewater data from the Waldbaum Plant, unit waste production was estimated for grading and breaking in terms of the pounds of BOD5 and gallons of wastewater resulting from processing each 100 cases of eggs. The results of these investigations also disclosed instances where waste reduction and egg-product recovery might be possible. (EPA - Corvallis)
W76-08170

WATER-RECYCLE WASHING OF REFINED SOYBEAN OIL: PLANT SCALE EVALUATION,
Anderson Clayton Foods, Inc., Sherman, Tex.
R. E. Beal, L. T. Black, E. L. Griffin, J. C. Meng, and G. S. Farmer.
Journal of American Oil Chemists Society, Vol. 50, p. 260-263, 1973. 1 fig, 6 tab, 9 ref.

Descriptors: *Food Processing Industry, *Soybeans, *Waste Water treatment, Recycling, *Water reuse.
Identifiers: *Soybean Oil Refinery, Wash Water Recycle, Economic Analysis.

A series of 24 hour tests was made in a commercial refinery under eight different operating conditions to select optimum conditions for a subsequent longer test of the antipollution recycle-washing process wherein wash water is recycled instead of being discarded. Alkali-refined oil was continuously washed at a rate of 15,000 lb/hr to remove sodium. Recycled wash water was then treated with a cation exchange resin to remove sodium. Two wash water pH levels, two oil-water ratios and the addition of a sequestering agent ethylene diamine tetraacetic acid (EDTA) to wash water, were factors investigated. For the longer test a water pH of 3.0 and an oil-water ratio of 4:1 were used, and EDTA was not added. Operating and analytical data, equipment specifications and cost data were acquired. The washed oil had a satisfactorily low content of sodium, iron and copper. After it was bleached the oil hydrogenated at a rate comparable to that of a conventionally washed oil. The bleached, deodorized oil had satisfactory flavor and flavor stability. The exchange resin required periodic caustic cleaning to maintain capacity. The new recycle process provides an economic solution to the wash water disposal problem. (EPA-Corvallis)
W76-08171

PAUNCH HANDLING AND PROCESSING TECHNIQUES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
J. L. Witherow.
The National Provisioner, Vol. 171, No. 17, October 26, 1974, p. 14-22. 1 fig, 1 tab, 36 ref.

Descriptors: *Food Processing Industry, *Industrial Wastes, *By-Products, *Waste Disposal, Soil Conservation, Waste water treatment, Waste treatment.
Identifiers: *Meat Packing Wastes, *Paunch Handling and Processing, Paunch Composition.

Three handling systems for paunch are presented and over a dozen processing techniques are discussed. The handling processes are the no dump, wet dump, and dry dump methods. Processing techniques covered are: (1) surface spreading, (2) subsurface spreading, (3) mixing with refuse, (4) mixing with feeds, (5) rendering, (6) rotary dryers, (7) fluid bed dryer, (8) solar and air drying, (9) filters and screens, (10) Incineration, (11) pyrolysis, (12) composting, (13) ensilage, (14) single cel protein cultures, (15) digestion, and (16) board mill. For handling, the dry dump is replacing the wet-dump, thus enabling more effective pollution control and by-product recovery. Of the possible processing methods, the production of soil conditioners by surface and/or subsurface spreading and the production of feeds by ensilage or drying appear to be the most feasible. Information also is given on the pollution potential and the composition of dehydrated paunch. (EPA - Corvallis)
W76-08173

REPORT ON METHODS OF CHROME RECOVERY AND REUSE FROM SPENT CHROME TAN LIQUOR,
Cincinnati Univ., Ohio. Tanners' Council Lab.
For primary bibliographic entry see Field 5D.
W76-08174

SOME ASPECTS OF TANNERY EFFLUENT CONTROL,
Garden State Tanning Co., Reading, Pa.
For primary bibliographic entry see Field 5D.
W76-08175

RECYCLING OF LIME-SULPHIDE UNHAIRING LIQUORS - I, SMALL-SCALE TRIALS,
Commonwealth Scientific and Industrial Research Organization, Parkville (Australia). Div. of Protein Chemistry.
For primary bibliographic entry see Field 5D.
W76-08179

A VERY RAPID LIMING AND TANNING PROCESS WITHOUT EFFLUENT,
Technische Hochschule, Darmstadt (West Germany). Institut fuer Makromolekulare Chemie.
E. Heidemann, O. Harenberg, and J. Cosp.
Journal of the American Leather Chemists Association, Vol. 68, No. 1, p. 520-532, December 1973. 1 fig, 1 tab, 3 ref.

Descriptors: *Tannery wastes, *Waste water treatment, Industrial wastes, Lime.
Identifiers: *Process change, Sodium Peroxide unhairing, Beamhouse, *Liming.

Reported are the results of a pilot-scale process using sodium peroxide for unhairing pelts. When the hides are placed in a strong sodium peroxide solution the hair is destroyed quickly and the fiber structure is opened up in an hour. The complete process, from the raw hides to a wet blue leather stock, takes only six hours. (EPA-Corvallis)
W76-08181

NO-EFFLUENT TANNERY PROCESSES,
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
D. A. Williams-Wynn.
Journal of the American Leather Chemists Association, Vol. 68, No. 1, p. 5-13, January 1973. 1 fig, 1 tab, 15 ref.

Descriptors: *Tannery wastes, Industrial wastes, Waste water treatment, Lime.
Identifiers: *Process change, Salt curing, Beamhouse, Liming, No-effluent tannage, Livitan process.

Reviewed are methods for eliminating or reducing the waste load from the individual processes in leather tanning. Alternatives to salt curing are proposed including one method which uses sodium chlorite. None of the methods is suitable for long term storage of hides. In the beamhouse, alternatives to liming are proposed with the most promising one being the use of caustic soda. However, as with the use of lime, it creates a sludge problem. Experiments have shown that tanners apply much more lime (4 percent solution) than necessary (1 percent solution), resulting in undissolved lime remaining in the effluent. Vegetable tannages with essentially no effluent are discussed. These are the Liritan (Leather Industries Research Institute) process and the more advantageous Liritan Semi-Rapid Sole Leather Tannage now in use in South Africa. The latter combines the no effluent properties of the former with the speed of drum tanning. (EPA-Corvallis)
W76-08182

WASTE TREATMENT AND CONTROL AT LIVE OAK POULTRY PROCESSING PLANT,
Gold Kist Inc., Atlanta, Ga.
W. J. Camp.
Presented at 18th Southern Water Resources and Pollution Control Conference, North Carolina State University, Raleigh, NC. April 9, 1969, p 36-40.

Descriptors: *Food processing industry, *Industrial wastes, *Waste water treatment, By-Products, Activated sludge, Florida, Waste treatment, *Aeration.
Identifiers: *Poultry processing wastes, *Extended aeration tanks.

An extended aeration system was installed to treat wastewaters from a poultry complex which in-

cludes a hatchery, feed mill, processing plant, and by-products plant. The waste treatment plant consisted of (1) a lift station with three collection tanks for segregation of waste streams, (2) a by-products collector tank, (3) two extended aeration tanks, (4) final settling tank with .35 MGD sludge return, (5) an aerobic digestor adjacent to and integral with extended aeration tanks, (6) a four acre polishing pond with chlorination, and (7) two sludge drying beds. Results are: (1) water usage about 7.6 gallons per bird, (2) BOD loading about 39 pounds per thousand birds, (3) in the by-product collector 35-45 percent removal of BOD 54-70 percent removal of suspended solids and 56-71 percent removal of grease. (4) 98.9-99.5 percent BOD removal in final clarifier effluent with 15 mg/l maximum and 8 mg/l average. Suspended solids removal of 98 percent with 10 mg/l maximum and 6 mg/l average and, (5) final effluent shows 99-100 percent BOD removal with 8 mg/l maximum and 3 mg/l average. (EPA-Corvallis)
W76-08185

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, TEXTILE INDUSTRY.
Lockwood Greene Engineers, Inc., Spartanburg, S. C.
For primary bibliographic entry see Field 5G.
W76-08186

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, CANNED AND PRESERVED FRUITS AND VEGETABLES,
Environmental Associates, Corvallis, Oreg.
For primary bibliographic entry see Field 5G.
W76-08187

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE ORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08188

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE INORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08189

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES PETROLEUM REFINING INDUSTRY, PART 1, CHAPTERS -V.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08190

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, PETROLEUM REFINING INDUSTRY, PART 2, CHAPTERS VI - IX.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08191

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, THE PERMIT PROGRAM.
Energy and Environmental Analysis, Inc., Arlington, Va.
For primary bibliographic entry see Field 5G.
W76-08193

WASTE WATER RECYCLED FOR USE IN REFINERY COOLING TOWERS,
Mobil Oil Corp., East Chicago, Ind.
For primary bibliographic entry see Field 5D.
W76-08270

CANADIAN MILLING PRACTICE FOR WATER RE-USE,
Department of Energy, Mines and Resources, Ottawa (Ontario). Mineral Processing Div.
For primary bibliographic entry see Field 5D.
W76-08272

ALTERNATIVES FOR REDUCING WATER POLLUTION IN CATTLEHIDE PROCESSING AND TANNING,
Economic Research Service, Washington, D. C. National Economic Analysis Div.
F. J. Poats, and J. Naghski.
In: USDA, Economic Research Service Marketing and Transportation Situation. MTS-191, p 29-33, November 1973, 1 fig, 1 tab.

Descriptors: *Tannery wastes, *Economic feasibility, Alternative planning, Alternative costs, Industrial wastes.
Identifiers: *Hide processor, *Transfer of operations.

Alternatives are presented to the traditional method of receiving salt cured hides in the tannery. Two solutions are proposed; (1) Transfer of beamhouse operations to hide processor where green hides would be blue chrome tanned and (2) transfer of total tanning operations to the hide processor who would then market fully tanned (crust) leather to the finisher. The feasibility of the two alternatives was determined. Preliminary results indicate both processes would be feasible from a leather quality point of view. Analysis regarding the economic feasibility of the alternatives will be reported later. Problems the industry would experience upon adoption of either alternative would be (1) the question of the marketability of chrome-tanned leather, (2) investment in new equipment by hide processor and relocation of skilled labor, (3) loss of internal quality control of hide material by tanners and (4) maintenance of salt-curing facilities to supply the export market. (EPA-Corvallis)
W76-08285

THE INFLUENCE OF SOILS AND PLANT COVER ON THE RETENTION AND UTILIZATION OF SUSPENDED AND DISSOLVED MATERIALS IN THE WASTE WATER OF A POULTRY PROCESSING PLANT,
Clemson Univ., S. C. Dept. of Agricultural Chemical Services.
For primary bibliographic entry see Field 5D.
W76-08287

NEW APPROACHES POINT TO BETTER ECONOMIES IN HIDE PROCESSING,
The National Provisioner, Vol. 172, No. 2, January 11, 1975 p. 18-20, 22, 27-28.

Descriptors: *Tannery waste, *Food processing industry, Industrial wastes, Industrial production, By-products, Proteins, *Waste water treatment, Costs.
Identifiers: *Hide processing industry, Solvent hide dehydration, Hide curing, Protein reclamation.

Discussed are hide curing by the solvent dehydration method, cost advantage of processing fresh hides into crust leather, short-term preservation of hides, and protein reclamation from unhairing effluents. The solvent dehydration method using acetone produces a hide that is lighter in weight, is soft and supple enough to ship in many convenient ways, and has a long storage life. Buying and selling is done on graded stock. By using fresh instead of salt-cured hides the tanner could reduce costs as much as 0.75 cents per hide and increase revenues by 3 percent. Present problem in implementation is the scattered locations of the slaughtering industry. Benzalkonium chloride solutions preserve hides for five days. Sodium sulfite or bisulfite and acetic acid will preserve fleshed and de-manured hides for up to 28 days. Protein reclamation of unhairing effluents by catalytic sulfide oxidation acidification to pH 4.2 produces a precipitate with a protein product of 80% purity and reduces the COD by 70%. (EPA-Corvallis)
W76-08288

WASTEWATER CONTROL AT EGG PRODUCTS PLANTS, PT. 1-3.
Poultry and Egg Inst. of America, Washington, D.C.
Informal Report, September 26, 1974, 12 p.

Descriptors: *Food processing industry, Industrial wastes, Industrial water, Water consumption, Effluents, Industrial production, Wastes, Biochemical oxygen demand, Chemical oxygen demand, *Waste water treatment, Poultry.
Identifiers: *Egg products plants, Waste management questionnaire, Wastewater characterization, In-plant wastewater control, Egg washing, Egg breaking.

Waste status in egg breaking plants, the estimation of BOD and COD for egg products, and in-plant wastewater control are the topics covered. Waste status was determined by a survey questionnaire sent to egg breaking plants. Information was obtained on production, water use, method of wastewater disposal, amounts of inedible eggs and shells, and any existent or anticipated problems in disposing of wastewater. About 2/3 of the plants use municipal sewers. Private systems could not handle increasing loads and/or meet discharge standards. BOD5 loads ranged from 11 to 70 pounds per 1000 pounds of product and wastewater volume varied from 0.4 to 2.7 gallons per pound of product. BOD and COD were determined from the amount of oxygen necessary to oxidize the various elements in the egg and were calculated to be 1.88 and 3.30 gms plr gram egg solids and per gram egg carbon respectively for the whole egg. Similar calculations were made for egg whites, yolk, and liquid egg products. Several in-plant areas which offer possibilities for waste load reduction are discussed. (EPA-Corvallis)
W76-08291

WASTES FROM THE POULTRY PROCESSING INDUSTRY,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
R. Porges, and E. J. Struzeski.
Technical Report SEC TR W62-3, 1962. 40 p, 15 fig, 4 tab, 40 ref.

Descriptors: *Food processing industry, *Reviews, Industrial wastes, Industrial water, By-products, *Waste water treatment, Waste identification, waste treatment, Water consumption, Water pollution control, Water pollution treatment, Biological treatment, Poultry.
Identifiers: *Poultry processing industry, State-of-the-art reviews, Waste water volume, waste water characterization, In-plant control.

Descriptions are presented of the processes employed in a poultry processing plant, the sources and characteristics of wastes, the total plant wastes and their pollutional effects, means for reducing the waste load, and separate and combined treatment of poultry wastewaters. Blood from the killing area represents the waste of greatest pollutional significance with its BOD5 of approximately 100,000 mg/l. Other critical areas are defeathering and eviscerating. Recovery for by-product useage significantly reduces the waste load. Blood recovery alone will reduce the BOD5

the effluent from 35 to 23 pounds per 1000 birds. eatment methods recommended for the wastes grease traps, primary settling, extended aera- n activated sludge, stabilization ponds, and land gation. (EPA - Corvallis)
76-08292

SIGN AND PERFORMANCE OF PHYSICAL-EMICAL AND ACTIVATED SLUDGE EATMENT FOR AN EDIBLE OIL PLANT,
sociated Water and Air Resources Engineers, ., Nashville, Tenn.
r primary bibliographic entry see Field 5D.
76-08293

CYCLING OF WATER IN POULTRY OCESSING PLANTS,
nford Research Inst., Menlo Park, Calif.
J. Rogers.
mmary Report, March 21, 1975. 37 p, 6 fig, 11 . EPA S-800930.

scriptors: *Food processing industry, *Water nsumption, *Recycling, Diatomaceous earth, tration, Ultraviolet radiation, Waste water atment, Screens, Water reuse, Operating costs, tivated carbon, Industrial wastes.
entifiers: *Poultry processing industry, *Chiller ter.

udies were conducted on recycling chiller water a poultry processing plant. The recycling system st be provided with the capability of removing ids and controlling the microbial population. V light was used to control the microbial popula- n. For effective control, solids must be removed a level to allow light transmission. Methods stu- d include: (1) cyclonic desludgers, (2) vibrating reens, (3) flotation cells, (4) centrifugal waste ncentration, (5) filtration with diatomaceous rth (DE) filter aid, and (6) activated carbon. ot-scale results showed that DE filtration was e most feasible option and that it maintained the cterial level below that of the nonrecycled stem. Operating costs for the De filtration stem with 30 gallon equivalence of ice per nute are $79.06/day. Normal operating costs of e chiller without recycle are $146.90/day, thus vings of $67.84/day result. These do not include npower and equipment costs. Figures are based a system that overflowed 100 gpm for an 18 ur day. (EPA - Corvallis)
76-08298

E, CONTINUED USE, AND REUSE OF BOTH OCESS AND WASTE WATERS IN POULTRY OCESSING OPERATIONS,
rth Carolina State Univ., Raleigh. Dept. of conomics.
A. Macon, W. M. Crosswhite, and R. E. rawan.
esented at 20th Southern Water Pollution Con- l Conference, Chapel Hill, NC, April 1971. 20 p, g, 5 tab.

scriptors: *Food processing industry, *Waste ter treatment, *Water reuse, Industrial wastes, erations, Waste treatment, Biochemical oxygen mand, Effluents, Treatment facilities, North rolina.
ntifiers: *Poultry processing wastes, *Waste duction, In-plant changes, Blood recovery.

nchmark information is given on water and ste quantities, waste water characteristics and ological characteristics of both the product and ter at selected points throughout the Gold Kist, ., Durham, NC poultry processing plant. Areas water use reduction are defined and consist of eviscеration, 2. scalding and defeathering, and cleanup. Changes made in these areas include e of improved nozzles, use of eviscerating flume ter for fresh water in scalding and defeathering, e of chiller water in scalder, and use of high- essure cleaning systems with foam. Waste reduction measures were an improved blood recovery system and the use of stunners prior to killing to reduce body action. Results reported are: 1. water use reduced from 850,000 to 620,000 gallons per day, 2. BOD5 reduced from 4000 lbs to 1500 lbs per day, 3. BOD5 concentration reduced from 600 to 290 mg/1, 3. grease reduced from 200 to 90 mg/1, 4. elimination of blood from plant effluent, and 5. control of feathers in the plant effluent. (EPA - Corvallis)
W76-08299

ECONOMICS OF IN-PLANT WASTE MANAGEMENT IN FOOD PROCESSING,
Economic Research Service, Washington, D. C. Natural Resource Economics Div.
W. M. Crosswhite.
Presented at Cornell Agricultural Waste Management Conference, February 1, 1972. 15 p, 3 fig, 4 tab, 9 ref.

Descriptors: *Food processing industry, *Waste water treatment, *Economic feasibility, Industrial wastes, *Water reuse, Waste treatment, Treatment facilities, Pollution taxes(Charges), Management, North Carolina.
Identifiers: *Poultry processing wastes, *Waste reduction, In-plant changes, Waste recovery, Waste management.

A case history of a project conducted at the Gold Kist, Inc., Durham, North Carolina poultry processing plant is presented. Results are described of water use and waste load reduction measures and the economic analysis of such reductions. Changes made to reduce water use were: 1. installation of distribution nozzles and body-control valves, 2. use of recirculated offal water in the feather flow-away system, 3. intermittent flow of water on sides of eviscerating trough, 4. flow regulation and control, 5. installation of water meters and pressure regulating valves, and 6. where possible, the flow rates of individual outlets were set by a fixed valve and handles removed. Expected results include reduction of water use from 12 to 7.8 gallons per bird, BOD5 from 560 to 200 mg/1, and grease from 200 to 20 mg/1. Economic feasibility studies show that 1. Without a surcharge: The improved blood recovery, new clean-up process and methods for reducing water use are expected to increase net revenue. Other waste recovery oriented methods such as the floatation unit would not increase net revenue. 2. With a surcharge: All of the process and equipment changes developed in the project increase net revenue and are economically feasible. (EPA - Corvallis)
W76-08300

OCEAN THERMAL ENERGY CONVERSION.
For primary bibliographic entry see Field 8C.
W76-08366

REMOVAL OF HEAVY METAL IONS FROM WASTEWATER,
Department of Agriculture, Washington, D. C. Office of the Secretary. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08402

WATER AND WASTE MANAGEMENT IN POULTRY PROCESSING,
North Carolina State Univ., Raleigh. Dept. of Economics.
W. M. Crosswhite, R. E. Carawan, and J. A. Macon.
In: Proceedings, 2nd National Symposium on Food Processing Wastes, March 23-26, 1971, p 323-335. 4 fig, 4 tab. Denver, Colorado. (EPA Water Pollution Control Research Series 12060---03/71).

Descriptors: *Food processing industry, *Waste water treatment, Industrial wastes, Poultry, Water reuse, North Carolina.
Identifiers: *Poultry processing wastes, *Waste reduction, In-plant changes, Blood recovery.

Benchmark information is given on water and waste quantities, waste water characteristics and biological characteristics of both the product and water at selected points throughout the Gold Kist, Inc., Durham, NC poultry processing plant. Areas of water use reduction are defined and consist of 1. evisceration, 2. scalding and defeathering, and 3. cleanup. Changes made in these areas include use of improved nozzles, use of eviscerating flume water for fresh water in scalding and defeathering, use of chiller water in scalder, and use of high-pressure cleaning systems with foam. Waste reduction measures included use of an improved blood recovery system and the use of stunners prior to killing to reduce body action. Results are 1. water use reduced from 850,000 to 620,000 gallons per day, 2. BOD5 reduced from 4000 lbs to 1500 lbs per day, 3. BOD5 concentration reduced from 600 to 290 mg/l, 3. grease reduced from 200 to 90 mg/l, 4. elimination of blood from plant effluent, and 5. feathers in the plant effluent have been controlled. (EPA - Corvallis)
W76-08428

RECOVERY AND SEPARATION OF CHEMICALS PRODUCED DURING KRAFT PULPING OPERATIONS,
Scott Paper Co., Philadelphia, Pa. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08467

PROCESS FOR THE ELECTROLYTIC RECLAMATION OF SPENT ETCHING FLUIDS,
Electrodics, Inc., Philadelphia, Pa. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08471

TREATMENT OF PHOTOGRAPHIC FERROCYANIDE-TYPE BLEACH SOLUTIONS FOR REUSE AND DISPOSAL,
Computerized Pollution Abatement Corp., Leicester, N. Y.
For primary bibliographic entry see Field 5D.
W76-08472

CRUDE SOAP RECOVERS MERCURY FROM WATER,
For primary bibliographic entry see Field 5D.
W76-08474

ELIMINATION METHOD FOR MERCURY RESIDUE IN WATER (SUICHU YOZON SUIGIN NO JOKYOHO),
For primary bibliographic entry see Field 5D.
W76-08476

PICKLING WITH HYDROGEN PEROXIDE SOLUTIONS,
For primary bibliographic entry see Field 5D.
W76-08479

WATER TREATMENT SYSTEM SAVES 45,000 GALS DAILY.
For primary bibliographic entry see Field 5D.
W76-08480

POLLUTION PROBLEM SOLVER,
Chrysler Corp. Syracuse, N. Y. New Process Gear Div.
For primary bibliographic entry see Field 5D.
W76-08483

IMS-GRANGCOLD PELLETIZING SYSTEM FOR STEEL MILL WASTES MATERIAL,
International Mill Service, Philadelphia, Pennsylvania.
For primary bibliographic entry see Field 5D.

W76-08491

METALLIC RECOVERY SYSTEM,
Air Preheater Co., Inc., Wellsville, N. Y. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08493

SOUR WATER TREATMENT PROCESS.
For primary bibliographic entry see Field 5D.
W76-08496

RAPSON IDEA SET FOR MILL TRIALS.
For primary bibliographic entry see Field 5D.
W76-08500

IRRIGATION SYSTEM MANAGEMENT FOR REDUCING PEAK ELECTRICAL DEMANDS,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 3F.
W76-08549

RESOURCE RECOVERY: POSSIBILITIES AND PITFALLS,
International City Management Association, Washington, D.C. Management Development Center.
For primary bibliographic entry see Field 5D.
W76-08692

REFUSE INTO POWER,
Louisville Univ., Ky. Dept. of civil Engineering.
For primary bibliographic entry see Field 5D.
W76-08693

PAPER MAKING WASTE-WATER PURIFICATION.
For primary bibliographic entry see Field 5D.
W76-08695

THE LONG HARD ROAD TO THE EFFLUENT-FREE PULP MILL,
For primary bibliographic entry see Field 5D.
W76-08698

THE EFFLUENT TREATMENT SYSTEM AND UTILIZATION OF RECYCLED WATER IN THE IYOMISHIMA MILL (DAIO SEISHI MISHIMA KOJO NI OKERU SOGO HAISUI SHORI TO HAISUI NO SAIRIYO),
For primary bibliographic entry see Field 5D.
W76-08700

RECYCLING--EXAMPLES FOR ITS POSSIBILITIES AND LIMITS (RECYCLING--BEISPIELE FUER MOEGLICHKEITEN UND GRENZEN),
For primary bibliographic entry see Field 5D.
W76-08701

CHEMICAL CLARIFICATION OF WASTE WATER.
For primary bibliographic entry see Field 5D.
W76-08702

THE EFFECTIVE MANAGEMENT OF WASTE.
For primary bibliographic entry see Field 5D.
W76-08704

THE ELECTROLYTIC PROCESSING OF CYANIDE WASTES,
For primary bibliographic entry see Field 5D.
W76-08706

STUDIES CONCERNING OIL REMOVAL FROM MILL SCALE (UNTERSUCHUNGEN ZUR ENTOELUNG VON WALZZUNDER),
For primary bibliographic entry see Field 5D.
W76-08707

INDUSTRIAL WASTE TREATMENT SYSTEM REDUCES POLLUTION,
Sherwood Medical Industries, Inc., Waterbury, Conn.
For primary bibliographic entry see Field 5D.
W76-08711

TREATMENT OF DYE WASTES WITH GRANULAR ACTIVATED CARBON,
ICI United States, Inc. Wilmington, Del.
For primary bibliographic entry see Field 5D.
W76-08716

A MODIFIED RAW-WOOL SCOURING SYSTEM FOR EASIER EFFLUENT TREATMENT,
Commonwealth Scientific and Industrial Research Organization, Belmont (Australia). Div. of Textile Industry.
For primary bibliographic entry see Field 5D.
W76-08717

CANTON'S FUTURISTIC WASTE TREATMENT SYSTEM,
For primary bibliographic entry see Field 5D.
W76-08720

RE-USE AND DISPOSAL OF WASTE ACIDS,
Hoeschst A. G., Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5D.
W76-08721

3F. Conservation In Agriculture

IRRIGATION SIGNALLING DEVICE,
E. W. McCloskey.
U.S. Patent No. 3,941,078, 3 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 135, March 2, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, Irrigation ditches, Irrigation systems, Irrigation efficiency, Floating, Equipment.
Identifiers: Signals.

An irrigation device which will signal the presence of water while water is flowing through the ditch, or which may be arranged to indicate that water has flowed through the ditch is described. The device has a body which has a lower portion which projects downward a distance below the bottom of the ditch in order to form a well in which the signal float is positioned. When the well is filled with water from the irrigation water flowing through the ditch, the float will be raised a considerable distance to give an adequate visual signal. The irrigation signal has a removable plug at the lower end of the body so that when the plug is in place irrigation water will be retained in the body and keep the float in a signalling position. When the plug is removed, the water will drain from the lower end of the body so that the signally float will be in signally position only when there is water in the irrigation ditch. (Sinha - OEIS)
W76-08196

ADJUSTABLE SOAKER HOSE SUPPORT ASSEMBLY,
K. E. Bradshaw.
U.S. Patent No. 3,941,342, 4 p, 12 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 224, March 2, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Irrigation operation and maintenance, Application equipment.
Identifiers: *Soaker irrigation.

Adjustable soaker hose support assemblies that are driven or forced into the earth in spaced relationship adjacent an area that is to be water are described. A soaker hose having a number of longitudinally spaced water discharge openings is secured to the assemblies. The assemblies so support the soaker hose, that both the hose and discharge openings may be manually adjusted to permit an area to be watered and then subsequently other areas. Upon completion of the watering operation the soaker hose is easily separated from the assemblies and the assemblies pulled from the earth and stored with the soaker hose until again needed. The assemblies are formed by conventional molding operations from a high impact polymercized resin. The assemblies may be supported in hard packed earth by being driven by hammer blows applied to the tops of the assemblies. (Sinha - OEIS)
W76-08197

SOIL MOISTURE REGIME AND PIGMENT CONTENT IN LEAVES OF CEREALS, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Insr. of Experimental Botany.
L. P. Smolyak, U. H. Reutski, Zh. I. Kazlova, and L. S. Sazonava.
Vyestsi Akad Navuk Bssr Syer Biyal Navuk 5, p 41-47, 1974.

Descriptors: *Soil moisture, Moisture content, *Leaves, Cereal crops.
Identifiers: *Pigment content(Leaves).

The maximum concentration of leaf pigments was noted in plots where the upper boundary of the transitional zone of the capillary fringe was at the soil surface. It is concluded that the groundwater level resulting in this position of the capillary fringe should be considered optimal.--Copyright 1975, Biological Abstracts, Inc.
W76-08304

CHANGE OF THE CONTENT AND STATE OF PIGMENTS IN LEAVES OF MALE AND FEMALE HEMP IN RELATION TO NUTRITION AND SOIL MOISTURE CONTENT, (IN RUSSIAN),
Kabardino-Balkarski Gosudarstvennyi Universitet, Nalchik (USSR).
For primary bibliographic entry see Field 2I.
W76-08306

CARBOHYDRATE TRANSFORMATION IN WHEAT AND RYE PLANTS UNDER EFFECT OF FLOODING IN THE AUTUMN-WINTER PERIOD, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
E. D. Ostaplyuk, L. L. Kurochkina, and V. E. Semenyuk.
Fiziol Biokhim Kul't Rast. 7(1), p 13-17, 1975.

Descriptors: *Wheat, *Carbohydrates, *Rye, Seeds, *Flooding, Seasonal, Crop response, Freezing.
Identifiers: Ethanol, Glycolysis, Lactate, Pyruvate, Saccharides, Winter wheat.

Excessive moistening and flooding of winter wheat and rye seedlings induced an increase in the glycolysis intensity in the tillering nodes, which is evidenced by accumulation of pyruvate, lactate and ethanol. At the end of autumn growth and at the beginning of winter, alongside the accelerated expenditure of monosaccharides, there occurs rapid hydrolysis of oligo-and polysaccharides in the flooded plants. Analogous transformations of reserve carbohydrates take place with the freezing

of plants into ice.--Copyright 1976, Biological Abstracts, Inc.
W76-08307

SALT AND WATER BALANCE IN IMPERIAL VALLEY, CALIFORNIA,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 3C.
W76-08331

GROUND TREATMENT APPARATUS,
A. N. Ede.
U. S. Patent No. 3,942,722, 10 p, 35 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 944, No 2, p 725, March 9, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation systems, *Sprinkler irrigation, Irrigation effects, Irrigation efficienty, Water delivery, Lateral conveyance structures.
Identifiers: Booms, Movable vehicles.

Irrigation apparatus is comprised of a movable vehicle arranged to be steered along a required ground path and carrying a pair of laterally-extending booms each of which is pivoted to one side of a rotatable turret mounted on the vehicle chassis. Each boom carries spray or sprinkler nozzles paced along their lengths and one or more spray nozzles at its tip, all connected to a supply of water. The spray patterns of the various nozzles overlap one another in such a way as to ensure even total dosage of water delivered per unit area of ground as the machine advances. The turret and booms can be angularly reciprocated about the vertical axis of the turret. The vehicle may be connected by a trailing flexible hose pipe to a hydrant, or may have a power-driven hose reel on which the hose is wound and by which it can be reeled in or unreeled while the vehicle is moving and with the hose either empty or delivering water. The flexible hose may be of a longitudinally-seamed construction. (Sinha-OEIS)
W76-08393

IRRIGATION SYSTEM (LIFTING DOGS),
R. D. Boone.
U. S. Patent No. 3,943,966, 5 p, 11 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1190, March 16, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practices, Sprinkler irrigation, Pipes, Water distribution(Applied), Application equipment.

An agricultural irrigation system has an elongated pipe adapted to carry sprinklers mounted on it. Water is supplied to the pipe under pressure. A number of vehicles support the pipe and each vehicle has an improved means for driving it. Two reciprocating cables are mounted on the pipe. One cable extends around a pulley at the end of the pipe and the other extends back to the power means. Alternate vehicles are attached to one or the other cables. At each vehicle the cable acts to both align the vehicle and power it through a 'joy stick' attached. Reciprocating motion of the 'joy stick' powers the vehicle and tilting motion aligns it. The alignment is accomplished by lifting the dog from a ratchet wheel. (Sinha-OEIS)
W76-08398

MOISTURIZING APPARATUS FOR USE WITH WIND MACHINES,
SSP Agricultural Equipment, Inc., Burbank, Calif. (Assignee).
D. E. Butler.
U. S. Patent No. 3,944,139, 4 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1248, March 16, 1976.

Descriptors: *Patents, *Humidity, *Mist, *Moisture, Agriculture, *Water utilization, Citrus fruits, Crops, *Mist irrigation.
Identifiers: Wind machines.

Moisturizing apparatus is adapted for use with conventional agricultural wind machines which at the present time are utilized by many large citrus groves for winter frost protection. The wind machines include a base set in the ground with a tower rising vertically to an elevation well above the trees. A power means is employed to rotate a fan blade at the top of the tower and air is drawn through the blade and spirally forced over the trees creating a disturbance of the ambient air preventing cold air to settle. The object of this invention is to provide a moisturizing means to force water into the air stream and force water-ladened air over the citrus trees to humidify the hot dry air which causes 'June Drop' of citrus buds. The invention includes an annular water manifold secured on top of the wind machine tower with a water supply means connected to the manifold. (Sinha-OEIS)
W76-08399

UNDERGROUND IRRIGATION SYSTEM,
E. J. Green.
U. S. Patent No. 3,946,762, 3 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2262, March 30, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Subsurface irrigation, *Irrigation efficiency, Irrigation practices, Pipes, Conduits, Flow, Subsurface drainage.

An irrigation or drainage system is comprised of one or more conduits having radially positioned spaced apertures in the walls. The system is otherwise closed except for an inlet/outlet aperture. The exterior of the conduits is covered by a snugly fitting fine mesh fabric sheath which covers all of the radial apertures, the interstices in the mesh of the fabric being very small and uniformly distributed so that fluid under slight to moderate pressure will flow through the sheath at least partially as the result of capillary action, and fluid distribution will be uniform throughout the length of the fabric sheath and about the periphery of the conduit. The conduits and fabric are composed of material resistant to the action of soil salts and irrigating fluids. The system works equally well in reverse direction so that it can also be used as a drainage system. (Sinha - OEIS)
W76-08406

SELF PROPELLED SPRINKLING IRRIGATION APPARATUS,
Gifford-Hill and Co., Inc., Dallas, Tex. (Assignee).
J. E. Hansen, and J. L. Jackson.
U. S. Patent No. 3,946, 946, 6 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2323, March 30, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practices, *Irrigation efficiency, Conveyance structures, Sprinkler irrigation, Water conveyance.

A self propelled sprinkling irrigation apparatus includes an elongated pipe line for transporting water with a number of interconnected pipe spans each having sprinkler mechanisms for distribution of the water. A pairof tension elements are connected adjacent the extremities of each pipe span. Load supporting elements are spaced along each of the pipe spans and are interposed between the pipe and the tension elements. A transverse brace is interposed between each of the pairs of load supporting elements and maintains the load supporting elements in stabilized diverging relation. A single stabilizer brace element extends between the pipe span and one of the tension elements. The stabilizer elements cooperating with successive pairs of the load carrying elements are connected to opposite ones of the tension elements. The stabilizer elements are placed in alternating directly connected relation with one of the load carrying elements of each pair of load carrying elements. The other load carrying element of each pair is indirectly but positively supported in space by support forces transmitted through the tension element. (Sinha - OEIS)
W76-08407

STUDY OF SELF-DIFFUSION OF WATER AND ITS ACTIVATION ENERGY IN CELLS OF DIFFERENT PLANT TISSUES, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
For primary bibliographic entry see Field 2I.
W76-08429

ECONOMIC EVALUATION OF PROPOSED WATER CONSERVATION PRACTICES ON ESTABLISHED IRRIGATION DISTRICTS: A GENERAL METHODOLOGY AND APPLICATION TO THREE DISTRICTS IN OREGON,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
F. S. Conklin, and W. E. Schmisseur.
Report prepared for Engineering and Research Center, Bureau of Reclamation, Denver, Colorado, May 1976. 109 p, 4 fig, 46 tab. BuRec 14-06-D-6808.

Descriptors: *Water conservation, *Irrigation districts, Methodology, *Evaluation, *Oregon, Estimating, Irrigation water, Water policy, *Algorithms, Income, *Water allocation(Policy), Investment, Alternative water use, Sprinkler irrigation, Crop production, Water storage, Water rates, Economics.
Identifiers: Economic models.

This study develops a quantitative framework to estimate economic effects from use of selected policy choices for conserving irrigation water. The framework is designed specifically to evaluate expected benefits of rehabilitation and betterment proposals submitted by established irrigation districts to the Bureau of Reclamation. District specific technical and economic relationships were modeled using a linear programming algorithm. District incomes, an aggregation of farmer returns above operating costs, were maximized with selected policy choices and compared against base, or 'as is' conditions. District water storage, pumping, and flow characteristics were resource restraints, while crops and selected irrigation technologies were activities. Five water conservation choices were evaluated: (1) capital investment in district main canal lining, (2) implementation of a district stored water holdover right, (3) expansion of district irrigable acreage, (4) modification of water charges paid by growers, and (5) on-farm conversion from flood to sprinkler irrigation. Water conservation choices for the North Unit, Stanfield, and Owyhee Irrigation Districts in Oregon were evaluated. Values of specific water conservation practices were a function of geographic, climatic, edaphic, institutional, legal, and operating conditions unique to each district. (Bureau of Reclamation)
W76-08431

AN OPTIMIZATION TECHNIQUE ADAPTED TO USDAHL-74 REVISED MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2A.
W76-08523

SOIL LOSS FROM ILLINOIS FARMS - ECONOMIC ANALYSIS OF PRODUCTIVITY LOSS AND SEDIMENTATION DAMAGE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4D.
W76-08533

NITROGEN CONSERVATION UNDER CORN PLANTED IN QUACKGRASS SOD,
Agricultural Research Service, Morgantown, W. Va.
O. L. Bennett, G. Stanford, E. L. Mathias, and P. E. Lundberg.
Journal of Environmental Quality, Vol. 4, No. 1, p 107-110, January-March 1975. 3 fig, 4 tab, 18 ref.

Descriptors: *Fertilization, Fertilizers, *Grasses, *Nitrogen, Crop response, *Corn(Field), Crop production.
Identifiers: *Atrazine, *Silage yields, *Quackgrass sod.

The mechanics of growing corn in a grass sod using the no-tillage concept have recently been developed. However, little is known about the fate of fertilizers, especially nitrogen, or the potential uses of such plant species as quackgrass in this management system. Silage yields of corn were determined from field studies in which corn sod-planted in quackgrass, treated with six rates of atrazine, was compared to conventionally planted corn. The effects of no tillage and conventional tillage, using two rates of atrazine on total soil N, and N mineralization potential were compared. Yields of corn silage produced in herbicide-treated quackgrass were significantly higher than yields from conventional tillage. In the first year, silage yields increased with rates of atrazine. Quackgrass persisted for a 2-year period at the three lowest rates of atrazine but not at higher rates. After the first season, mineral N (largely NO(3)-N) was significantly greater under untilled quackgrass than under plowed plots. However, by the following spring differences associated with tillage method had disappeared. Soil N mineralization potential, NO, and total N in the 0- to 15-cm layer were considerably higher for untilled than for plowed soils. However, in untilled plots, these values were unaffected by rate of atrazine. (Skogerboe-Colorado State)
W76-08541

LIMITED IRRIGATION OF GRAIN SORGHUM IN ALTERNATING STRIPS WITH WHEAT,
Southwestern Great Plains Research Center, Bushland, Tex.
J. T. Musick, and D. A. Dusek.
Transactions of the ASAE American Society of Agricultural Engineers, Vol. 18, No. 3, p 544-548, May-June 1975. 5 fig, 3 tab, 12 ref.

Descriptors: *Sorghum, *Wheat, Irrigation, Irrigation practices, Furrow irrigation, Surface irrigation, Irrigation effects, Crop response, Crop production, Great Plains.

Grain sorghum and winter wheat are the two major irrigated crops in the Southern High Plains. In 1973, irrigated grain sorghum was grown on 863 200 ha and irrigated winter wheat on 486 000 ha. Declining groundwater tables and well yields necessitate conservation and efficient use of limited irrigation water supplies. Management practices are needed for reducing water application in furrow irrigated systems. Results are reported from the grain sorghum phase of a 6-yr field study in which grain sorghum and winter wheat were grown in alternating 4.56-m wide drill strips. (Skogerboe-Colorado State)
W76-08542

DEEP TILLAGE OF GRADED-FURROW-IRRIGATED PULLMAN CLAY LOAM,
Southwestern Great Plains Research Center, Bushland, Tex.
J. T. Musick, and D. A. Dusek.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 2, p 263-269, March-April 1975. 9 fig, 3 tab, 14 ref.

Descriptors: Soil environment, Soil investigations, *Soil management, *Soil properties, Soil texture, Crop response, Surface irrigation, Irrigation, Furrow irrigation, Loam, *Cultivation, Clays.
Identifiers: *Tillage depth.

Pullman clay loam was deep tilled with a large moldboard plow to 40, 60, and 80 cm in 1966 at the USDA Southwestern Great Plains Research Center, Bushland, Texas. Deep tillage was compared with 20-cm normal tillage depth. The deep tillage treatments partially or completely penetrated slowly permeable clay Bt horizons that extended to about the 60-cm depth and partially mixed the clay Bt with the more permeable clay loam surface A horizon. The long-term effects were evaluated during the production of nine crops over a 7-yr. period. The major effects on increasing water intake and yields under limited irrigation were obtained from increasing tillage depth from 20 to 40 cm. Increasing tillage depth to 60 and 80 cm, which completely penetrated the slowly permeable clay Bt horizon, had a smaller additional effect on water intake and little or no additional effect on yields. (Skogerboe-Colorado State)
W76-08543

IRRIGATING CORN AND GRAIN SORGHUM WITH A DEFICIENT WATER SUPPLY,
California Univ., Davis. Dept. of Water Science and Engineering.
J. I. Stewart, R. D. Misra, W. O. Pruitt, and R. M. Hagan.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 2, p 270-280, March-April 1975. 7 fig, 8 tab, 15 ref.

Descriptors: *Corn, *Sorghum, *Irrigation, *Irrigation effects, *Irrigation practices, Crop response, Evapotranspiration, *Crop production, Water supply.

Maximizing crop production with limited irrigation water requires quantitative information about differential yield responses to given levels of water deficit in each major growth period. Corn grain yield is especially vulnerable to water deficits during the pollination period, provided the crop has experienced little or no ET deficit in the late vegetative period, ending at first tassel. However, the susceptibility of corn yield to deficits in the pollination period is greatly lessened if there have been prior deficits. This is expressed as a 'conditioning' factor which is important to the planning of irrigation programs which, either by choice or by exigencies of water supply, include evapotranspiration (ET) deficits during one or more major growth periods. Grain sorghum yield is markedly less sensitive to ET deficits than corn, and there is no indication that a conditioning factor operates with this crop. The yield reduction ratios found for the two crops are summarized. (Skogerboe-Colorado State)
W76-08544

DRAIN ENVELOPE RESPONSE TO FIELD TREATMENTS,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 4A.
W76-08548

IRRIGATION SYSTEM MANAGEMENT FOR REDUCING PEAK ELECTRICAL DEMANDS,
Agricultural Research Service, Lincoln, Nebr.
L. E. Stetson, D. G. Watts, F. C. Corey, and I. D. Nelson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 2, p 303-306, 311, March-April 1975. 3 fig, 1 tab, 9 ref.

Descriptors: *Electric power demand, *Irrigation operation and management, Irrigation effects, Nebraska, Irrigation, Agriculture, Energy, Demand, Water management(Applied).

Peak summer power demand and the ratio of summer to winter loads limit electric energy for irrigation in Nebraska. An experiment conducted to schedule operation of irrigation systems during hours of lower electrical demand showed that peak summer demand loads can be reduced. The peak electrical demand of a power district was reduced, but crop yields were not. The scheduled irrigation systems used less total energy and water. Power districts and irrigators are expected to use results of this experiment either to increase the area irrigated or to reduce future energy and water demands. (Skogerboe-Colorado State)
W76-08549

PLANNING IRRIGATION AND DRAINAGE SYSTEMS USING RETENTION AND EXTRACTION LIMITS,
Bureau of Reclamation, Denver, Colo.
M. D. Campbell, and W. D. Lembke.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 3, p 514-517, May-June 1975. 8 fig, 15 ref.

Descriptors: *Irrigation, *Drainage, *Planning, Irrigation engineering, Drainage engineering, Model studies.

Rather than explaining that water held in the soil between field capacity and the wilting percentage is available for plant growth and then trying to define field capacity and wilting percentage to suit needs, two new range limits are defined and the use of these limits to provide for efficient use of water and maximum plant growth is illustrated. Data reported by Denmead and Shaw (1962) and a model developed by Campbell (1972) were used to display the ideas associated with these limits. (Skogerboe-Colorado State)
W76-08553

RELATION BETWEEN PLANT TRANSPIRATION AND METABOLISM, (IN RUSSIAN),
Tashkent Agricultural Academy (USSR).
For primary bibliographic entry see Field 2D.
W76-08583

GREAT PLAINS EVAPOTRANSPIRATION BY A RESISTANCE MODEL USING REMOTELY SENSED THERMAL IMAGERY,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
For primary bibliographic entry see Field 2D.
W76-08585

RESISTANCE-ENERGY BALANCE METHOD FOR PREDICTING EVAPOTRANSPIRATION: DETERMINATION OF BOUNDARY LAYER RESISTANCE AND EVALUATION OF ERROR EFFECTS,
For primary bibliographic entry see Field 2D.
W76-08586

AN EVALUATION OF A RESISTANCE FORM OF THE ENERGY BALANCE TO ESTIMATE EVAPOTRANSPIRATION,
For primary bibliographic entry see Field 2D.
W76-08587

RESISTANCE-MASS TRANSFER METHOD FOR ESTIMATING EVAPOTRANSPIRATION: COMPARISON WITH LYSIMETRIC MEASUREMENTS IN IRRIGATED SORGHUM,
For primary bibliographic entry see Field 2D.
W76-08588

COMPARISON OF A MODIFIED BROWN-ROSENBERG RESISTANCE MODEL WITH OTHER EVAPOTRANSPIRATION ESTIMATION METHODS: TESTS IN AN IRRIGATED SORGHUM FIELD,
For primary bibliographic entry see Field 2D.
W76-08589

CANOPY TEMPERATURE MEASUREMENT OF SORGHUM AND MILLET WITH LEAF THERMOCOUPLE AND INFRARED THERMOMETER TECHNIQUES,
For primary bibliographic entry see Field 2D.
W76-08590

NATURAL AND AGRICULTURAL ECOSYSTEMS,
Tasmanian Coll. of Advanced Education, Launceston.
For primary bibliographic entry see Field 6G.
W76-08667

OUTFLOW FROM VARIOUS SUBSURFACE DRAINAGE MATERIALS,
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 4A.
W76-08669

NITRATE, PHOSPHATE, AND POTASSIUM MOVEMENT INTO DRAINAGE LINES UNDER THREE SOIL MANAGEMENT SYSTEMS,
Florida Univ., Fort Pierce. Inst. of Food and Agricultural Science.
For primary bibliographic entry see Field 5B.
W76-08680

GRAPHIC DETERMINATION OF SUB-MAIN PIPE SIZE FOR SOLID-SET SPRINKLER IRRIGATION ON STEEP, NON-UNIFORM SLOPES,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
W. R. DeTar.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 3, p 503-504, 507, May-June 1975. 3 fig, 1 tab, 1 ref.

Descriptors: *Sprinkler irrigation, *Irrigation, *Irrigation engineering, *Hydraulic design, Hydraulics, Slopes, Piping systems,(Mechanical), Pipes.
Identifiers: *Pipe size.

Analytical solutions to the problem of selecting the proper size for sub-main descending steep, irregular slopes for solid-set irrigation systems can be tedious. A simple graphical method is presented here for obtaining fairly uniform pressures along the sub-main. The method is particularly useful for any solid-set system that repeatedly uses the same lateral size and spacing. (Skogerboe-Colorado State)
W76-08682

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

IDENTIFICATION, MEASUREMENT, AND INCORPORATION OF ENVIRONMENTAL QUALITY OBJECTIVES IN NATURAL RESOURCE DEVELOPMENT,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-08101

EFFICIENT RESOURCE UTILIZATION WITHIN A REGIONAL FRAMEWORK.
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-08102

MULTIPLE USE EVALUATIONS ON PONDEROSA PINE FOREST LAND,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
M. B. Baker, Jr., and H. E. Brown.
In: 18th Annual Arizona Watershed Symposium Proceedings, Phoenix, September 25, 1974, Report No. 6, p. 18-25. 9 fig, 1 tab.

Descriptors: Water yield improvement, *Forest managment, *Multiple purpose, *Ponderosa pine trees, *Arizona.
Identifiers: Beaver Creek Project(Ariz), Salt-Verde River Basin(Ariz).

Principal resource responses resulting from manipulating ponderosa pine forests growing on volcanic soils, such as water yield, timber volume, understory plant production and forage for wildlife are cited. Four major areas are described in which additional knowledge is needed: (1) ecological relationships in growing ponderosa pine on sedimentary-derived soils; (2) transmission losses between source of water increase and storage; (3) effect of vegetative manipulations on sediment yield, pine regeneration, wildlife use, recreation and esthetics; (4) detailed inventory of pine type to determine its acreage by stand density, soil type, precipitation amount and other factors. (Forest Service)
W76-08109

PINYON-JUNIPER CONTROL--DOES IT PAY,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary.
In: 18th Annual Arizona Watershed Symposium Proceedings, Phoenix, September 25, 1974, p 26-29. Report No. 6.

Descriptors: *Ponderosa pine trees, *Juniper trees, *Arizona, *Water yield improvement, Forest management, *Multiple purpose, Watershed management costs.
Identifiers: Utah juniper, Alligator juniper,Verde and Salt River Basins(Ariz), Beaver Creek watershed(Ariz).

Current results of water yield improvement tests in the pinyon-juniper type are examined in light of their impacts on multiple uses of the land. The changes in values are considered in relation to management costs. Results obtained on the Beaver Creek watershed, Coconino National Forest, are emphasized because considerable multiple use information has been developed there. Results from studies of related areas such as Corduroy Creek and Cibecue Ridge are utilized in formulating the conclusions for this vegetation type. Research needs also are described. (Forest Service)
W76-08110

ON-SITE RUNOFF DEPLETION AT THREE IMPOUNDMENTS,
Agricultural Research Service, Chickasha, Okla.
R. R. Schoof, and J. W. Naney.
Journal of Soil and Water Conservation, Vol. 31, No. 2, p 67-70, March-April 1976. 2 fig, 4 tab, 5 ref.

Descriptors: *Runoff, *Impoundments, *Oklahoma, *Evaporation, *Seepage, Sandstones, Channels, Floodwater, Irrigation wells, Groundwater, Withdrawal, Water storage, Hydrologic budget, Water loss, Precipitation(Atmospheric), Evapotranspiration.
Identifiers: Caddo County(Okla), Runoff depletion, Soil Conservation Service, Depletion rates, Floodwater-retarding impoundments, *Sugar Creek watershed(Okla).

On-site flow depletions for three floodwater-retarding impoundments, constructed by the Soil Conservation Service on Sugar Creek in Caddo County, Oklahoma, were analyzed. Annual evaporation and seepage varied from 52 to 103 inches. The higher depletion rates were associated with an impoundment located on a sandy valley floor. A pervious sandstone abutted the dam on both ends, and two irrigation wells were located nearby. Measured seepage from one of the impoundments accounted for 15.6% of the combined seepage and evaporation. About one-third of this seepage reappeared in the down-stream channel. The other two impoundments had more long-term storage of groundwater and less return flow to the channel. Analysis of the water budgets for the three floodwater-retarding impoundments indicated that little water flowed past the structures in years with less-than-normal precipitation. Runoff depletion at the three sites was similar to that for floodwater-retarding impoundments in Texas and Oklahoma. (Roberts - ISWS)
W76-08122

SNOWMELT-RUNOFF MODEL FOR STREAM FLOW FORECASTS,
Eidgenoessische Institut fuer Schneeund Lawinenforschung, Davos (Switzerland).
For primary bibliographic entry see Field 2E.
W76-08131

LAND USE AND WATER QUALITY IN NEW YORK RIVERS,
Cornell Univ., Ithaca, N. Y. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08133

EVALUATION OF ERTS DATA FOR CERTAIN HYDROLOGICAL USES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 7C.
W76-08147

ECONOMIC CONCEPTS AND TECHNIQUES PERTAINING TO WATER SUPPLY, WATER ALLOCATION, AND WATER QUALITY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-08152

WATER SUPPLY.
Institute for Water Resources (Army), Fort Belvoir, Va.
In: 'Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality,' IWR Paper 75-P5, December 1975, Part One. 67 p, 4 fig. DACW31-76-M-0435.

Descriptors: *Planning, *Water supply, *Groundwater, *Reservoir yield, *Economic efficiency, Humid areas, Alternative planning, Water demand, Conjunctive use, Methodology, Design flow, Water shortage, Risks, Water costs, Maintenance costs, Operating costs, Industries.

The role that groundwater should be accorded in future allocations of surface water storage for water supply is examined and quantified, based on a description of a generalized water supply system. Methodologies are provided for determining the least-cost water supply alternative, and subsidiary system design considerations; and for estimating, for any given water demand center, the economically most efficient development schedule and management regimen for surface and groundwater resources. Details are given for planning for a surface water supply based on demand estimates, decision functions, sizing water supply, and reservoir operation. Procedures for joint ground and surface water use are given together with cost indices for construction, operation and maintenance of surface reservoirs for generating approximate costs. Assessment of economic risk of water supply shortages is based on a model of loss functions. The effects of changes in price and water quality, and in water pollution abatement

regulations, on industrial technological changes in process design and plant location decisions are computed by equations based on the level of gross water use, the level of intake water use, the relationship between these two, and the price elasticity of water, thus generating use/cost ratios. (See also W76-08152) (Auen-Wisconsin)
W76-08153

WATER ALLOCATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-08154

LAND-USE MODEL FOR SERVICE AREA PROJECTION,
Brookhaven National Lab., Upton, New York, Dept. of Applied Science.
For primary bibliographic entry see Field 5G.
W76-08226

REASSESSMENT OF THE CROSS-FLORIDA BARGE CANAL: A PROBABILITY APPROACH,
California Univ., Santa Barbara. Dept. of Economics.
L. J. Mercer, and W. D. Morgan.
Journal of Environmental Economics and Management, Vol. 2, No. 3, p 196-206, February 1976. 2 fig, 6 tab, 17 ref. OWRT A-053-CAL(2)

Descriptors: *Canals, *Assessment, *Probability, *Cost-benefit analysis, Projects, Discount rates, Environment, Planning, Decision making, Cost-benefit ratio, Recreation, Transportation, Operation and Maintenance, Systems analysis, Risks.
Identifiers: *Cross-Florida Canal, *Weibull distribution, Sensitivity analysis.

This reassessment of the Corps of Engineers' study of the Cross-Florida Canal demonstrates the application of the Weibull probability distribution to handle uncertainty in benefit-cost analysis and illustrates the distribution's use to incorporate environmental considerations in project analysis. With range and probability assumptions to reflect the criticisms of the Corps' study, it is shown that the Canal was a high-risk project even with the inappropriately low discount rate used. Use of the Weibull distribution is shown to be superior to the usual point estimates and range sensitivity tests in benefit-cost analysis. (Bell-Cornell)
W76-08228

MEASURING WATERSHED LAND-USE CHANGES WITH AIRPHOTOS,
Clemson Univ., S. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-08229

DRAINAGE RUNOFF OF THE GROUNDWATER UNSTEADY FLOW TO THE DRAINS (DRENAZNY ODTOK PRI NEUSTALENOM PRUDENI PODZEMNEJ VODY K DRENOM),
For primary bibliographic entry see Field 4B.
W76-08239

ULTRASONIC RIVER FLOW MEASUREMENT,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 7B.
W76-08241

PUMPS FREE CITY FROM LAKE ERIE FLOODING.
For primary bibliographic entry see Field 8C.
W76-08250

ALTERNATIVE METHODS OF ESTIMATING SNOW WATER PARAMETERS,
Idaho Univ., Kimberly. Water Resources Research Inst.
For primary bibliographic entry see Field 2C.
W76-08259

THE RELATIONSHIP BETWEEN WATERSHED USE AND STREAM WATER QUALITY,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 4D.
W76-08282

THE EFFECT OF FOREST STANDS ON THE WATER CONTENT OF ROCKS OF THE LOESS COVER IN THE WESTERN REGIONS OF THE NORTHERN BLACK SEA AREA, (IN UKRANIAN),
USSR Akademiya Nauk URSR, Kiev. Instytut Geologichnykh Nauk.
V. F. Krayev, and V. S. Lyukshyn.
Dopov Akad Nauk Ukr Rsr Ser B Heol Heofiz Khim Biol 3, p 210-213, 1975.

Descriptors: *Forests, *Loess, *Water supply, Watersheds(Basins), Soil types, Moisture content.
Identifiers: *Black Sea Area, *USSR(Ukranian SSR).

The water supply of the loess cover rocks in the western regions of the Northern Black Sea area (Ukrainia, SSR, USSR) is determined not only by the regional peculiarities of its geological structure but also by the local forest stands. In the watershed plane areas loess of the Knieper horizon underlying the 2nd fossil soil contains water in a zone 150-250 m wide and the Oka loess underlying the 3rd fossil soil in a zone 400-600 m wide on both sides of the forest strips. The optimal density of the forest stand network provides for the formation of water-bearing horizons of continuous distribution.--Copyright 1975, Biological Abstracts, Inc.
W76-08303

EXAMINATION OF THE CONCEPT AND USE OF THE STANDARD PROJECT FLOOD,
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 8B.
W76-08321

INVESTIGATION OF USE OF SPACE DATA IN WATERSHED HYDROLOGY,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
B. J. Blanchard.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-21770, $6.00 in paper copy, $2.25 in microfiche. Final Report, January 25, 1975. 125 p, 9 fig, 4 tab, 4 ref, 1 append. NASA S-70251-AG.

Descriptors: *Remote sensing, *Flood forecasting, *Runoff, *Oklahoma, *Runoff coefficient, *Land use, *Hydrology, *Rainfall-runoff relationships, Flood data, Flood plain zoning, Watersheds(Basins), Satellites(Artificial), Model studies, Data processing.
Identifiers: *Watershed models, *ERTS data, *Runoff curve number, Watershed characteristics.

Digital data from the ERTS multispectral scanner was used to investigate the feasibility of identifying differences in watershed runoff capability with spaceborne sensors. Linear combinations of the two visible light bands and a combination of the four visible and near infrared bands were related to a coefficient used in the Soil Conservation Service storm runoff equation. Good relationships were found in two scenes, both with dry surface conditions, over the same watersheds. The relationships defined by both combinations of digital data were tested on an independent set of 10 watersheds and on an additional 22 subwatersheds. Coefficients predicted with the ERTS data proved better than coefficients developed with conventional methods. (Terstriep-ISWS)
W76-08326

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY, PART II: NON-CONSERVATIVE SPECIES TRANSPORT MODELS,
Alabama Univ., Dept. of Chemical and Metallurgical Engineering.
For primary bibliographic entry see Field 5B.
W76-08327

HOW MUCH PRECIPITATION GOES TO INFILTRATION DURING A STORM PERIOD,
Karnataka Regional Engineering College, Surathal (India). Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 2A.
W76-08339

DIMENSIONLESS SOLUTION OF DAM-BREAK FLOOD WAVES,
Patras Univ. (Greece). School of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-08343

CHANGE IN YIELD OF WATER FOLLOWING A BUSHFIRE IN A FOREST OF EUCALYPTUS REGNANS,
Melbourne and Metropolitan Board of Works (Australia).
For primary bibliographic entry see Field 4C.
W76-08349

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, UNIT 2, SAN BENITO, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for San Benito County, June, 1975. 21 p, 12 fig, 21 plates, 6 tab.

Descriptors: *Flood flow, *Flood profiles, *Flood data, *Flood stages, *Flood damage, *Flood forecasting, *Bank erosion, Storms, Flood frequency, Historic floods, Flood peak, Flood frequency, Deposition, Warning systems, Levee, Reservoir, *California, Deposition(Sediments).
Identifiers: San Benito County(Calif), *San Felipe Lake(Calif), Tequisquita Slough(Calif), Santa Ana Creek(Calif), Arroyo de las Viboras(Calif), Arroyo dos Picachos(Calif), Pacheco Creek(Calif), Dunneville(Calif), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

San Felipe Lake, all that remains of an ancient lake bed, receives the waters of Tequisquita Slough, Santa Ana Creek, Arroyo de las Viboras and Arroyo dos Picachos (cumulative drainage area=115 square miles). The very flat flood plains are used for agriculture and have scattered farm buildings and residences. Levees constructed by private interests protect some portions of the study area. No regulatory measures exist for reducing flood damage. An irrigation reservoir located in the headwaters of Arroyo de las Viboras stores 540 acre-feet. Historically, flooding (16 damaging floods since 1909) has occurred from November to April, as the result of prolonged rainfall. Newspaper accounts and the gage on Pacheco Creek near Dunneville indicate that the worst flood on record occurred in December, 1955, when flood elevations reached 251.7 ft and 250 persons were evacuated in Northern San Benito County. Flood elevations at the Pacheco Creek gage could be expected to reach 267 feet and 279 feet during an Intermediate Regional Flood and a Standard Project Flood respectively. Both floods would result in severe streambank erosion(channel velocities during an IRF in Tequisquita Slough=5-10 ft/sec) and the deposition of silt (overbank

elocities during an IRF=2-5 ft/sec). Peak lischarge in Tequisquita Slough at San Felipe Lake would reach 16,000 cubic feet per second nd 21,000 cfs during an IRF and SPF respectively. (Henley - North Carolina)
W76-08376

FLOOD PLAIN INFORMATION: ALAMO AND ULATIS CREEKS, VACAVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for Solano County, California, June, 1973. 44 p, 22 fig, 16 plates, 6 tab.

Descriptors: *California, *Floods, *Flooding, *Streamflow forecasting, *Flood profiles, *Flood plaines, Flood frequency, Peak discharge, Flood peak, Stream erosion, Deposition(Sediments), Bank erosion, Obstruction to flow, Zoning, Channel improvement.
Identifiers: Alamo Creek(Calif), Ulatis Creek(Calif), Encinosa Creek(Calif), Laguna Creek(Calif), Vacaville(Calif), Standard Project Flood, Intermediate Regional Flood.

Major and minor flooding has occurred in this area, which comprises the flood plains of 4 streams, 12 times between 1937 and 1973. The stream system rises in the Vaca Mountains draining into the Sacramento River. Alamo Creek is a tributary to Ulatis Creek in the lower reaches of the drainage basin. Their flood plains are almost parallel in the study area. Encinosa and Laguna Creek are westside tributaries of Alamo Creek. Some orchards and croplands are interspersed with suburban development adjacent to Vacaville. The estimated 1973 population of 23,000 in the study area is expected to reach 55,000 by the year 2000. No streamflow data has been kept, but hydrologists stated that the 1967 and 1973 floods had a frequency of 25 years. Damage has generally been limited to streambank erosion, deposition of debris, damage to roads, bridges, and crops. Floods caused by heavy rain over a long period of time occur between October and April. In an Intermediate Regional Flood peak flows of 4400 cfs and water velocities of 3 to 8 feet per second are expected in the main channel and from 1 to 4 ft/sec in the overbank area. This flood would rise to peak in 4 hours and the duration of the flood stage would be 7 hours. Eighteen bridges and culverts would obstruct flood flow. In a Standard Project Flood peak flows of 5800 cfs are expected. The time of rise is predicted to be 6 hours and the duration above flood stage 11 hours. Twenty-three bridges and culverts would be obstructive to flood flow. Some channel improvement work has been undertaken by the U.S. Soil Conservation Service upstream from the study area; it is expected to provide protection against a 10-year flood. No other flood control facilities have been proposed. (Smith-North Carolina)
W76-08377

FLOOD PLAIN INFORMATION: EEL RIVER--STAFFORD TO HOLMES, HUMBOLDT COUNTY, CALIFORNIA,
Army Engineer District, San Francisco, Calif.
Prepared for Humboldt County, California, December, 1970. 35 p, 7 fig, 11 plates, 6 tab.

Descriptors: *Floods, Flooding, *Flood forecasting, *Flood profiles, *Flood data, *Flood damage, *Flood plains, *California, Flood flow, Streamflow forecasting, Maximum probable flood, Historic floods, Flood frequency, Peak discharge, Flood peak, Obstructions to flow, Flood plain zoning.
Identifiers: Stafford(Calif), *Eel River(Calif), Larabee Creek(Calif), Standard Project Flood, Elinor(Calif), Shively(Calif), Pepperwood(Calif), Holmes(Calif), Intermediate Regional Flood.

The flood plains in this study are generally devoted to agricultural production, though the farmland is bordered by giant redwood trees. The Eel River flows through narrow V-shaped canyons through most of its length and debouches into a wide floored delta near its mouth. Floods in the past have generally occurred in the winter, as did the great floods of 1955 and 1964, the latter being almost equivalent to a Standard Project Flood (SPF) with the community of Pepperwood being completely destroyed while Shively and Stafford had only a few buildings left standing. Damages were estimated to be in excess of $5,000,000. During the 1955 flood damages were about $3,500,000. Depths of water ranged up to 20 feet in the study area in 1964. Two gaging stations provided basic hydrologic data. The 1964 flood had a peak discharge of 752,000 cfs and rose in a period of 40 hours. It was 72 feet above the streambed at its maximum. Water velocities ranged from 5 to 16 feet per second. In an Intermediate Regional Flood Eel River at Scotia could rise 56 feet above the streambed in a period of 50 hours; in an SPF a rise of 63 feet in a period of 52 hours is forecasted for same location. Average water velocities in an SPF could be expected to be those of the 1964 flood. The single bridge spanning the Eel River is not expected to be an obstruction in any flood, though the redwood trees are obstructive to flood flows. Flood plain ordinances have been adopted by Humboldt County, though no flood control projects have been proposed. (Smith - North Carolina)
W76-08378

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, PACHECO CREEK, SAN BENITO COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for San Benito County, July, 1973. 18 p, 10 fig, 13 plates, 6 tab.

Descriptors: *Floods, *Flood profiles, *Flood stages, *Flood plains, Flooding, *Flood forecasting, Flood flow, Historic floods, Flood frequency, Peak discharge, Flow duration, Flow characteristics, Flood damage, Rivers, Warning systems, *California, Lake beds, Debris.
Identifiers: San Benito County(Calif), San Felipe Lake(Calif), Pacheco Creek(Calif), Tesquisquita Slough(Calif), Santa Ana Creek(Calif), Arroyo de las Viboras(Calif), Dunneville(Calif), Pajoro River(Calif), Standard Project Flood, Intermediate Regional Flood, Santa Clara County(Calif).

Waters from Pacheco Creek (reach length 37 miles), Tesquisquita Slough, Santa Ana Creek, and Arroyo de las Viboras, flow into San Felipe Lake draining 284 sq mi of San Benito and Santa Clara Counties. The slope of Pacheco Creek is 80 ft/mi above the stream gage near Dunneville and 10 ft/mi below the gage. Development in the flood plain, a very flat ancient lake bed, is agricultural with scattered farm buildings and residences. Levees constructed by local interests protect some portions of the study area but there are no regulatory measures specifically to reduce flood damage. Flooding occurs from heavy rainfall between November and May. Nineteen damaging floods have occurred in the last 125 years with the worst one in December, 1955, having a peak discharge of 12,600 cubic feet per second. Two hundred and fifty persons were evacuated. Anticipated rise of Pacheco Creek near Dunneville would be 14 ft/for an Intermediate Regional Flood (IRF), 17 ft for a Standard Project Flood (SPF). An IRF would have peak discharge of 23,000 cfs, channel velocities of 7-8 ft/sec in the upper study reaches, 5-6 ft/sec in the lower reaches with overbank velocities of 1-3 ft/sec in San Felipe Lake area. The SPF would have a peak discharge of 29,000 cfs with slightly higher flow velocities. (Henley - North Carolina)
W76-08379

FLOOD PLAIN INFORMATION: SAN ANTONIO CREEK AND TRIBUTARIES, VICINITY OF OJAI, VENTURA COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
Prepared for the County of Ventura, June 1973. 34 p, 25 fig, 28 plates, 7 tab.

Descriptors: *Floods, Flooding, *Flood profiles, *Deposition(Sediments), *Flood plains, Floodwater, Regional flood, Flood forecasting, Historic floods, Flood data, Flood frequency, Peak discharge, Flood peak, Erosion, Obstructions to flow, Non-structural alternatives, Land use, Control structures, Dikes, Channel improvement, *California.
Identifiers: San Antonio Creek(CA), Thacher Creek(CA), Reeves Creek(CA), Ojai(CA), *Ventura River(CA), Intermediate Regional Flood, Standard Project Flood.

Most of the lands along the channels are agricultural, primarily orchards and ranches, though there are many houses, utilities, roads and bridges in the flood plains. Pressure for urban expansion is continuing. The drainage basin, covering 51.2 square miles, has both mountains and flatlands, chiefly alluvial cones. Streams include San Antonio Creek flowing into the Ventura River and Thacher Creek with its tributary Reeves Creek. Storms generally occur from November to April, and streamflow is very seasonal because of the lack of snowpack. One streamgage has been in place since 1927. The highest peak flow, 16,200 cubic feet per second, was recorded in 1969. This resulted in $400,000 damages to property owned by the City of Ojai. In an Intermediate Regional Flood a peak discharge of 19,900 cfs with water velocities of 8 to 11 ft/sec in the channel and 4 to 6 ft/sec in the overbank are predicted. The flood would rise 3.5 feet in 1.4 hours and flood stage would last 2.5 hours. In a Standard Project Flood a peak discharge of 26,500 cfs and water velocities of 9 to 13 ft/sec in the channel and 4 to 7 ft/sec in the overbank are anticipated. The height of rise of 4.0 feet would occur in 1.7 hours and the flood stage would last 3 hours. The 8 bridges across the San Antonio River and Thacher Creek would be obstructive to both major floods. Flood control measures include a debris basin constructed to protect the City of Ojai from debris-laden flows, some channel improvement and private dikes, as well as land use ordinances and subdivision ordinances adopted by the County of Ventura which generally require protection from the 50 year flood. (Smith - North Carolina)
W76-08380

FLOOD PLAIN INFORMATION: PURGATOIRE RIVER AND TRIBUTARIES, VICINITY OF TRINIDAD, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
Prepared for the City of Trinidad, Colorado, April 1974. 57 p, 15 fig, 45 plates, 6 tab.

Descriptors: *Floods, *Flood plains, *Flood profiles, *Flood stages, Runoff, Storms, Historic floods, Flood data, Flood frequency, Peak discharge, Flow characteristics, Flow duration, Channels, Flood damage, Flood protection, Dams, Control structures, *Colorado.
Identifiers: *Purgatoire River(Co), *Trinidad(Co), *Las Animas County(Co), Starkville(Co), Raton Creek(Co), Colorado Canyon(Co), Moores Canyon(Co), Prospect Canyon(Co), Pinon Canyon(Co), Portland Avenue Canyon(Co), Hospital Canyon(Co), Carbon Arroyo(Co), Fishers Peak Arroyo(Co), Powell Arroyo(Co), Intermediate Regional Flooding, Standard Project Flood.

Flood hazards are discussed for 7.6 miles of the Purgatoire River extending downstream from the Trinidad Dam, along 4.4 miles of Raton Creek's lower channel through Starkville and along a cumulative total of 9.8 miles of smaller tributaries including Colorado, Moores, Prospect, Pinon, Portland Avenue and Hospital Canyons, and Carbon, Fishers Peak and Powell Arroyos. These streams drain an area of 98 sq mi below Trinidad Dam and have an average slope of 29 ft/mi. The flood plains contain commercial, industrial, utility, highway, and railroad uses. Continued area growth is expected to result in further development of the flood plains. Obstructions to flood flows include

bridges, vegetation, landfills, private levees, and a closed conduit of Fishers Peak Arroyo as it flows through Trinidad's business district. Flood control attempts include channel straightening, concrete retaining walls, bank protection, and the Trinidad Lake project, located 4 mi southwest of Trinidad which regulates flood discharges up to and including those of the Standard Project Flood. Flooding can occur from April through August as the result of frontal storms and thunderstorms. The most damaging historic flood occurred in May 1955 and did $4 million damage in Trinidad and Starkville. Peak discharge on the Purgatoire was 28,000 cubic ft/sec. The Intermediate Regional Flood and the SPF would have peak discharges of 24,500 and 55,100 cfs respectively. The IRF would rise at a maximum rate of 6.5 ft/hour and remain at peak stage for 2 hours. Channel velocities would average 10 ft/sec; overbank flows would average 1.0 ft/sec. Flood heights could reach a maximum of 5.8 and 13 ft above bank in IRF and SPF respectively. (Henley-N. Carolina)
W76-08381

SNOW-REGULATING ROLE OF THE FOREST BELTS IN THE STEPPES OF THE KRASNOYARSK KRAI, (IN RUSSIAN),
For primary bibliographic entry see Field 2C.
W76-08383

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER AND TRIBUTARIES, GREAT BEND, KANSAS, TO JOHN MARTIN DAM, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
Jun 1974. 30 p, 3 fig, 24 plates, 4 tab.

Descriptors: *Floods, *Floodway, Flooding, Runoff, *River flow, *Zoning, Building codes, *Reservoir, Development policies, *Non-structural alternatives, Levees, Diversion structures, Channel improvement, Flood proofing, Flood insurance, *Kansas, *Colorado.
Identifiers: *Arkansas River, John Martin Dam(CO), Great Bend(KS), Dodge City(KS), Fort Dodge-Wilroads Gardens(KS), Larned(KS), Garden City(KS), Standard Project Flood, Intermediate Regional Flood, Great Bend Local Protection Project.

'Costly floods may be expected to recur in the Arkansas River subbasin between John Martin Dam and Great Bend, Kansas, regardless of existing and authorized flood control projects. Most losses involve flooded agricultural land in the valley, but properties along tributaries and low-lying urban areas also suffer. Flood damages are caused when the runoff from steep tributary streams converges into the broad valleys with flatter slopes and lower energy gradients. These low velocity flood flows not only increase the duration of flooding, but permit sediment and debris to be deposited on the valley's most productive lands. ' The Kansas and Colorado area is dry with considerable water infiltration. It is not unusual that downstream will have much less flow than upstream where flooding has occurred. Eight major floods have occurred since 1900. Floods are caused by rainstorms. Existing flood damage prevention measures include reservoirs, including John Martin Dam and Reservoir, diversion structures, channel and floodway improvements and levees. Designated floodways, zoning ordinances, subdivision regulations and building codes are described as elements of flood plain management designed to reduce flood damage. At Garden City, Kansas, peak discharge for the Standard Project Flood and Intermediate Regional Flood are 114,000 and 53,000 cubic feet per second respectively. (Gentry-North Carolina)
W76-08388

FLOOD PLAIN INFORMATION: SALINE RIVER AND TRIBUTARIES, BENTON, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
Prepared for the City of Benton, October, 1971. 33 p, 17 fig, 15 plates, 8 tab.

Descriptors: *Floods, Flooding, *Flood forecasting, *Flood profiles, *Flood data, *Flood plains, *Arkansas, Flood flow, Streamflow forecasting, Maximum probable flood, Rainfall, Peak discharge, Flood damage.
Identifiers: *Saline River(Ark), Willow Depot Creek(Ark), Benton(Ark), Standard Project Flood, Intermediate Regional Flood, Williams Creek(Ark).

The Saline River Basin comprises 3270 square miles; the drainage area consists of 590 sq mi in the mountain section, 2550 sq mi in the hill section, and 130 sq mi in the flood plain. At Benton, a manufacturing center with a growing population, the drainage basin is about 5 mi long and covers 9 sq mi. As the city expands housing and industrial developments are being built in greater flood-risk areas. The main flood season is winter and spring, though floods have occurred at other times. The greatest flood, in 1927, reached a gage height of 34.0 ft, as measured from a high water mark. The 1969 flood, the largest recorded by streamflow gages, reached a height of 31.0 feet. Flood damages were estimated at $150,000 and included destruction of bridges, loss of livestock and damage to residences. An Intermediate Regional Flood (IRF) would reach a gage height of about 34.1 ft, similar to the 1927 flood, from rainfall amounting to 9.0 inches in 24 hours and 10.7 inches in 48 hours. Water velocities from 11 to 16.5 ft/sec in the channel and 2.5 to 4 ft/sec in the overbank area are predicted. A Standard Project Flood (SPF) would reach a height of 41.1 ft, occurring after rainfall of 8.8 inches in 6 hours, 11.2 inches in 12 hours, 13.8 inches in 24 hours, for a total of 17.4 inches in 96 hours. Water velocities from 12.5 to 21.5 ft/sec in the channel and from 3 to 5 ft/sec in the overbank area are anticipated. Most bridges, with the exception of Interstate 30 Bridge, would be obstructive to the IRF and even more obstructive to the SPF. The feasibility of a dam on the Saline River above Benton is being studied, but no flood prevention measures are now in effect. (Smith - North Carolina)
W76-08389

FLOOD PLAIN INFORMATION: COLORADO RIVER AND RIFLE, GOVERNMENT, HUBBARD GULCH CREEKS, RIFLE, COLORADO.
Army Engineer District, Sacramento, Calif.
Prepared for the City of Rifle, April 1973. 34 p, 12 fig, 16 plates, 7 tab.

Descriptors: Floods, *Flood plains, *Flood data, *Flood profiles, Flood flow, Runoff, Cloudbursts, Snowmelt, Flood plain insurance, Reservoirs, Diversion structure, Peak discharge, Flow duration, Flow characteristics, *Colorado, *Colorado River.
Identifiers: Rifle Creek(Co), Government Creek(Co), Hubbard Gulch Creek(Co), Rifle(Co), Garfield County(Co), Intermediate Regional Flood, Standard Project Flood.

The study area comprises the flood plains along a 3.9 mile reach of the Colorado River (total drainage area 6,930 square miles), the lower 2.8 miles of Rifle Creek (drainage area 201 sq. mi), the lower .6 mile of Government Creek (drainage area 43 sq. mi.), and the lower .8 mile of Hubbard Gulch Creek (drainage area 8 sq. mi.) in the corporate limits of Rifle. Because Rifle is a local center for retail trade, transportation and recovery and processing of mineral resources, continued development is expected with pressure for expansion on the flood plains which are already extensively developed. Damaging floods occur every six years. Major flooding along the Colorado River, usually the result of late spring snowmelt, is characterized by moderate peaks, long duration of flows, and marked diurnal fluctuations Flood damage is chiefly to agricultural development caused by streambank erosion and deposition of silt. Flooding on the creeks normally results from summer cloudbursts runoff and is characterized by high peak flows, short duration, and small volumes. Vegetation, 5 bridges, 2 culverts and Pioneer Ditch diversion structure where silt accumulation has contributed to overbank flooding during high flows obstruct flood flows. The Intermediate Regional Flood and the Standard Project Flood on the Colorado River would have peak discharges of 45,000 and 56,000 cubic feet per second respectively. IRF and SPF peak discharges on Rifle Creek would be 5,700 and 13,000 cfs, respectively. Channel and overbank velocities for these streams are in the range of 8.9 feet per second and 2-4 ft/sec respectively. (Henley - North Carolina)
W76-08390

APPLICATION OF THE NATIONAL WEATHER SERVICE FLASH-FLOOD PROGRAM IN THE WESTERN REGION,
National Weather Service Salt Lake City, Utah. Western Region.
G. Williams.
NOAA TM NWS WR-103, 20 p, 2 fig, 4 tab, 29 ref. January 1976.

Descriptors: *Floods, *Flash floods, *Flood forecasting, Flood data, Warning systems, Flood control, Flood protection, Weather, Weather forecasting, Precipitation(Atmospheric), Networks.
Identifiers: *Flash-flood watches, *Flash-flood warnings, Flood alarms, Flash-flood alarm systems, Rain gage network.

The National Weather Service uses four methods to communicate warning information regarding potential flash floods to the general public. These are flash-flood watches and warnings, a flash-flood alarm system, self-help procedures, and informational materials, each described, along with advantages and some disadvantages. A combination of at least two may be desirable. A technique utilizing an intensity rain gage network would fill a large void left by present methods. Often in the western U.S. soil moisture condition of a basin preceding the rainfall which causes a damaging flash flood is not a dominant factor in affecting amount of runoff. Since very short-term rainfall is the controlling factor in many, if not most flash floods, the traditional flash-flood guidance based on three-hour rainfall which is calculated from antecedent moisture conditions and rainfall duration is not always applicable. A guidance factor related to individual basin characteristics and potential rainfall rates would be more appropriate. (NOAA)
W76-08415

PRESENT AND FUTURE MULTIPLE USE DEMANDS ON THE PINYON-JUNIPER TYPE,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary.
The Pinyon-Juniper Ecosystem: A Symposium. May 1975. Utah State University, Utah Agric. Exp. Stn, Logan. p 19-26 5 fig, 27 ref.

Descriptors: Pinyon pine trees, *Demand, Natural resources, *Forest management, Land use, Land management, Juniper trees, Multiple purpose.
Identifiers: *Pinyon-juniper type, *Multiple use demands.

A discussion is presented of the relative and absolute importance of various uses and demands on pinyon-juniper woodlands, in light of future management requirements. Although various people feel that the pinyon-juniper woodland should be managed to give highest priority to some specific use, such as livestock, wildlife, or wood products, future management should result in a shifting mosaic of activities with each site managed over time for that needed product, product mix, or sequence of uses for which it is best adapted. Whatever the products produced,

he pinyon-juniper lands must be carefully nanaged; we will need to use our resources ever nore efficiently. (Forest Service)
W76-08430

WATER RESOURCES OF THE WORLD, SELECTED STATISTICS.
Geraghty and Miller, inc., Port Washington, N.Y.
For primary bibliographic entry see Field 7C.
W76-08507

CHANNEL FLOW OVER PERMEABLE BEDS OF GRADED SPHERES,
Humphreys (Howard) and Sons, Reading (England).
For primary bibliographic entry see Field 8B.
W76-08511

EFFECTS OF HYDROLOGIC REGIME ON MAGNITUDE AND FREQUENCY OF DOMINANT DISCHARGE,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-08514

THE GROUNDWATER OUTCROP-EROSION MODEL; EVOLUTION OF THE STREAM NETWORK IN THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Instituut voor Aardwetenschappen.
For primary bibliographic entry see Field 2A.
W76-08515

SOME THEORETICAL CONSIDERATIONS IN RESERVOIR DESIGN,
Bechtel Corp., San Francisco, Calif.
For primary bibliographic entry see Field 8B.
W76-08518

A RECONSIDERATION OF THE FIERING TWO-STATION MODEL,
Birmingham Univ. (England). Dept. of Mathematical Statistics.
A. J. Lawrence.
Journal of Hydrology, Vol. 29, No. 1/2, p 77-85, March 1976. 1 ref.

Descriptors: *Model studies, *Synthetic hydrology, *Mathematical studies, Synthesis, Multiple purpose, Correlation analysis, Non-uniform flow.
Identifiers: *Fiering two-station model, *Synthetic flows, Satellite station, Cross-correlation, Skewness, Autoregressive equation.

The Fiering model for the simultaneous generation of synthetic flows at a key station and one satellite station was reconsidered. After pointing out some inadequacies in Fiering's analysis, the model was reformulated. It was then shown how its parameters could be chosen so as to preserve the historical monthly means and variances at each station, and also the first-serial correlation at each station and the simultaneous cross-correlation. The complete correlation structure of the model was obtained. It was further shown how to preserve the historical skewness coefficients of each flow. Finally, a possible extension involving two satellite stations was riefly mentioned. (Roberts-ISWS)
W76-08519

ENVIRONMENTAL MONITORING FROM SPACECRAFT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W76-08532

INVESTIGATION OF ROADWAY DRAINAGE AS RELATED TO THE PERFORMANCE OF FLEXIBLE PAVEMENTS,
South Carolina Univ., Columbia, Coll. of Engineering.
For primary bibliographic entry see Field 8B.
W76-08534

ANALYSIS OF ERTS-1 IMAGERY OF WYOMING AND ITS APPLICATION TO EVALUATION OF WYOMING'S NATURAL RESOURCES,
Wyoming Univ., Laramie. Dept. of Geology.
R. S. Houston, R. W. Marrs, and L. E. Borgman.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-26468, $9.75 in paper copy, $2.25 in microfiche. Final Report, January 1975. 290 p, 13 fig, 1 tab, 127 ref, 25 append. NASA NAS5-21799

Descriptors: *Remote sensing, *Geology, *Vegetation, *Land use, *Wyoming, Satellites(Artificial), Aerial photography, Maps, *Natural resources, Mountains, Agriculture, Soils, Ecology, Forests, Hydrology, Geothermal studies, Snow cover, Snowmelt, Analytical techniques, Computer programs.
Identifiers: *ERTS.

The data provided by the Earth Resources Technology Satellite is unquestionably an important new tool for earth resource applications. Successful applications demonstrated by investigators include: (1) general geologic mapping, (2) structural and tectonic studies, (3) landforms and surface processes, (4) mineral exploration, (5) land-use inventories, (6) hydrologic studies, (7) investigations in agriculture and forestry, and (8) environmental quality and ecology. The chief advantages of the ERTS-1 data for geologic studies are the synoptic view, spectral information, and seasonal coverage. The spectral data and the repetitive aspect are even more important for land use and vegetation studies. The main limitations of the ERTS data are low resolution and lack of stereoscopic coverage. Computer techniques were not used successfully as a means of automated mapping or interpretation, but can provide a very powerful tool to assist the interpreter in some applications. (Sims-ISWS)
W76-08535

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT, AND DEVELOPMENT OF WATER RESOURCES,
Ecosystems International, Inc., Gambrills, Md.
For primary bibliographic entry see Field 6B.
W76-08536

THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Corps of Engineers, Waltham, Mass. New England Div.
S. Cooper, P. Bock, J. Horowitz, and D. Foran.
Available from the National Technical Information Service, Springfield, Va. 22161, as N75 24059, $5.50 in paper copy, $2.25 in microfiche. Final Report, March 1975. 105 p, 26 fig, 5 tab, 7 ref. NASA S-70256-AG.

Descriptors: *Remote sensing, *Reservoir operation, *Water resources, *Water quality, Satellites(Artificial), Instrumentation, Snow cover, Snowmelt, Turbidity, Sedimentation, Floods, Watershed management, Data collections, Data processing, Reservoirs, Dams, Lakes.
Identifiers: *ERTS.

The New England Division, Corps of Engineers (NED) participated in the ERTS-1 experiment to assess the possible future usefulness of satellites such as ERTS in the operation of its water resources systems used to control floods. Based on two years' experience with a 26-station network in New England, NED has found real time data collection by orbiting satellite relay to be both reliable and feasible. Orbiting satellite systems can be designed that are more flexible, easily maintained and less expensive than conventional ground-based means. In the assessment of ERTS imagery, it was found that better spatial resolution and/or additional spectral bands would be required to satisfy NED'S needs, in most cases. Also, the mass of data presented in an image is too unwieldy for timely analysis by photointerpretive techniques. A man-computer interactive system, using Cathode Ray Tube display could solve the latter problem. Real time imagery acquisition on an every day or every other day basis would be essential in a fully operational environment. (Sims - ISWS)
W76-08537

UTILIZATION OF ERTS-1 DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
C. W. Welby, J. O. Lammi, and R. J. Carson, III.
Available from the National Technical Information Service, Springfield, Va. 22161, as N75 20796, $6.75 in paper copy, $2.25 in microfiche. Final Report, October 1, 1974. 154 p, 18 fig, 2 tab, 7 ref. NASA NAS5-21732.

Descriptors: *Remote sensing, *Geology, *Forestry, *Water resources, *North Carolina, Satellites(Artificial), Mapping, Geologic mapping, Land use, Evaluation, Forest management, Water management(Applied), Data processing, Analytical techniques, Rivers, Estuaries, Coasts, Water quality.
Identifiers: *ERTS.

ERTS-1 imagery has been evaluated for use in resource planning and management in North Carolina, and found to be useful for general reconnaissance purposes in forestry, geology, and water resources work. It has also been used for studying largescale transient phenomena such as river plumes and movement of sediment in the sounds. ERTS-1 imagery has been an aid to geologic and land-use mapping. Stereoscopes, projectors of various kinds and microscopes have proved useful instruments for the kinds of data acquisition needed by resource planners and managers. (Sims - (ISWS)
W76-08538

DRAIN ENVELOPE RESPONSE TO FIELD TREATMENTS,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. S. Willardson, S. Davis, D. Mulder, and J. R. Spencer.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 1, p 134-136, January-February 1975. 6 fig, 2 ref.

Descriptors: *Drains, *Drainage, *Drainage engineering, *Drainage systems, Hydraulic conductivity.
Identifiers: *Drain envelopes.

One of the principal reasons for installing a drain envelope is to decrease hydraulic resistance in the vicinity of the drain openings. This experiment has shown that contamination of the envelope material with fine particles, whether naturally occurring or added during installation, causes the hydraulic conductivity of a drain envelope to decrease drastically. Furthermore, conditions are created which may result in a discharge rate decreasing with time. A drain with a clean, well-graded envelope will accept water without a water table build-up over the drain. A water table above a drain indicated a back pressure in the drain or a high hydraulic resistance in the envelope. In the experiment, the latter was the reason for poor drain envelope performance but both conditions should be avoided. The results of the experiment

have led to the following conclusions: (a) As little as 5 percent of field soil in the envelope material seriously reduces drain envelope performance, (b) flooding trenches for consolidation of backfill material does not significantly affect drain envelope performance, and (c) high-pressure jet cleaning of drains improves hydraulic performance of drain envelopes. (Skogerboe-Colorado State)
W76-08548

PLANNING IRRIGATION AND DRAINAGE SYSTEMS USING RETENTION AND EXTRACTION LIMITS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 3F.
W76-08553

INTERSTATION CORRELATION OF PEAK-FLOW ESTIMATES,
Geological Survey, Reston, Va.
C. H. Hardison.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 221-222, March-April 1976. 1 fig, 2 ref.

Descriptors: *Peak discharge, *Estimating equations, *Streamflow forecasting, *Gaging stations, *Correlation analysis, Methodology, Statistical methods.

Equations are given for using the correlation coefficient between annual peaks at a pair of stream gaging stations to estimate the interstation correlation coefficient of estimated T-year peaks, computed standard deviations, and computed skew coefficients at the same pair of stations. The equations are based on statistics computed from samples of annual peaks simulated from normal distributions with built-in interstation correlation. The interstation correlation of 50-year peaks was found to be about equal to the square of the interstation correlation coefficient of the annual peaks. (Woodard-USGS)
W76-08555

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 1. SURFACE WATER RECORDS--VOLUME 2: NORTHERN GREAT BASIN AND CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-08556

GEOLOGY AND WATER RESOURCES OF MARSHALL COUNTY, SOUTH DAKOTA--PART 1: GEOLOGY AND WATER RESOURCES,
Geological Survey, Huron, S. Dak.
N. C. Koch.
South Dakota Geological Survey University of South Dakota, Vermillion, Bulletin 23, 1975. 76 p, 38 fig, 2 plates, 12 tab, 21 ref, append.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Water quality, *South Dakota, Hydrologic data, Hydrogeology, Aquifer characteristics, Water yield, Water utilization, Water analysis, Chemical analysis.
Identifiers: *Marshall County(S Dak).

Marshall County, a recreational and agricultural County in northeastern South Dakota, has an area of 888 sq mi. Pleistocene glacial and lacustrine deposits of late Wisconsin age and Holocene (Recent) sediments make up most of the surficial deposits. Glacial deposits as much as 805 feet thick overlie sedimentary rocks of Cretaceous age. The surface water supply includes several small intermittent streams and numerous marshes, ponds, and lakes. Most field analyses of water samples from 37 lakes and ponds showed a specific conductance of less than 1,000. Glacial deposits of sand and gravel are the important water-bearing units in Marshall County. Of the six aquifers in drift that are described, the James, Veblen, and Coteau-lakes aquifers can provide yields of 500 gpm or more to properly constructed wells. The major constituents of these aquifers are calcium, sodium, bicarbonate, and sulfate. The Dakota aquifer, consisting of sandstone of Cretaceous age, underlies all of Marshall County at depths of from 900 to 1,500 ft. Water in the aquifer is under artesian pressure and in low-lying areas many wells flow. Water from the Dakota aquifer is not suitable for irrigation because of its poor quality. (Woodard-USGS)
W76-08558

WATER QUALITY IN THE MAD RIVER BASIN, HUMBOLDT AND TRINITY COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-08562

HYDROLOGY OF THE THREE SINKHOLE BASINS IN SOUTHWESTERN SEMINOLE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
W. Anderson, and G. H. Hughes.
Florida Bureau of Geology, Tallahassee, Report of Investigations No 81, 1975. 35 p, 15 fig, 8 ref.

Descriptors: *Lake stages, *Sinks, *Karst hydrology, *Urbanization, *Flood protection, *Florida, Environmental effects, Lakes, Water levels, Flood plains, Hydrologic data, Topography, Geology, Groundwater movement, Surface waters, Streamflow, Aquifers.
Identifiers: Seminole County(Fla), *Sinkhole basins.

The southwestern part of Seminole County in east-central Florida is characterized by sinkholes formed by the subsidence of surficial deposits into solution cavities in the underlying limestone deposits. The area includes three sinkhole basins: Cranes Roost, Palm Springs, and Grace Lake. Cranes Roost basin (drainage area, 5.02 sq mi) contains a closed drainage system of lakes and swamps, including Lakes Adelaide, Florida, and Mobile, that terminates at Cranes Roost sink. It also contains Lake Orienta and two unnamed sinks which do not overflow into Cranes Roost sink. Palm Springs basin (drainage area, 1.77 sq mi) includes Lake Marion, Eleventh Hole Pond, and several small unconnected sinks. Grace Lake basin (drainage area, 1.64 sq mi) includes Island Lake which overflows into Grace Lake. The recent spread of urban development has tended to encroach on the flood plains of lakes in these sinkhole basins and cause concern over flood hazards. An investigation was made to document the highest known lake levels, to examine possible effects of urbanization, and to appraise the possibilities of controlling lake levels to reduce or limit the flood hazard. The highest lake stages of record in the three sinkhole basins occurred in September 1960. Analyses of the hydrologic relations between lake stages, groundwater levels, stream discharges, and rainfall in the area indicated that the lake stages of September 1960 probably were the highest attained since at least 1895. (Woodard-USGS)
W76-08572

OUTFLOW FROM VARIOUS SUBSURFACE DRAINAGE MATERIALS,
Department of Agriculture, Lethbridge (Alberta). Research Station.
T. G. Sommerfeldt.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 1, p 85-88, 94, January-February 1975. 8 fig, 2 tab, 16 ref.

Descriptors: *Drainage, Drainage engineering, *Drainage systems, *Drains, Lysimeters, *Subsurface drainage.

In lysimeters, the discharge from 55-, 65-, and 105-mm-ID perforated plastic drains and 105-mm-ID clay tile drains, with and without gravel or fiberglass envelopes, was determined in clay loam and fire sandy loam soil. In the field, the rate and volume of discharge from 65-mm flexible plastic and 105-mm clay tile drains, installed with fiberglass envelopes in 1968, were determined between 1969 and 1971. The soil, which was coarse textured, was flooded five times in 1969, six times in 1970, and twice in 1971. Generally, no one drain produced greater discharge than another. (Skogerboe-Colorado State)
W76-08669

PRELIMINARY HYDROLOGIC DESIGN OF SMALL FLOOD DETENTION RESERVOIRS,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 8B.
W76-08731

EXTREME RAINFALL STUDIES OF THE BRAHMANI, THE BURHABALANG, THE RUSHIKULYA AND THE SUBARNAREKHA RIVER CATCHMENTS,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2B.
W76-08733

COMPLEX WIDTH-DISCHARGE RELATIONS IN NATURAL RIVER SECTIONS,
Lanchester Polytechnic, Coventry (England).
For primary bibliographic entry see Field 2E.
W76-08735

DISTRIBUTIONS OF BOD AND DO IN RIVERS AND LAKES,
Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Ingenieria.
For primary bibliographic entry see Field 5B.
W76-08743

4B. Groundwater Management

GROUND WATER FLOW NO LONGER A MYSTERY,
National Water Well Association, Columbus, Ohio.
For primary bibliographic entry see Field 2F.
W76-08114

DETERMINING AQUIFER TRANSMISSIVITY BY MEANS OF WELL RESPONSE TESTS: THE UNDERDAMPED CASE,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 2F.
W76-08124

ESTIMATION BY DIGITAL COMPUTER OF THE DRAWDOWN CAUSED BY GROUNDWATER WITHDRAWAL,
Research Inst. for Water Resources Development, Budapest (Hungary).
F. Szekely.
Hydrological Sciences Bulletin, Vol. 20, No. 3, p 341-351, September 1975. 3 fig, 1 tab, 8 ref.

Descriptors: *Drawdown, *Pumping, *Computer programs, Digital computers, Regional analysis, Evaporation, Seepage, Equations, Water wells, Water table, Water table aquifers, Numerical analysis, Approximation method, Transmissivity, Groundwater, *Withdrawal.
Identifiers: Regional drawdown, Local drawdown, Boussinesq equation.

The method described has been developed for estimating the two-dimensional, unsteady drawdown pace created by groundwater withdrawal. In the nalysis of regional drawdown, discrete wells are eplaced by two-dimensional withdrawal disributed uniformly over the well field. Withdrawal f this kind can be approximated by the henomenon of evaporation, and allowed for irectly in the differential equation of two-dimenional, unsteady seepage by introducing an addiional function. (Visocky-ISWS)
W76-08140

WATER SUPPLY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 4A.
W76-08153

METHOD FOR LOCATING AND EVALUATING GEOTHERMAL SOURCES OF ENERGY BY SENSING ELECTROSTATIC VOLTAGE GRADIENTS,
W. L. Sayer, and P. Wright.
U.S. Patent No. 3,942,101, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 461, March 2, 1976.

Descriptors: *Patents, *Geothermal studies, *Thermal properties, Thermal conductivity, Geophysics, Electrical equipment.
Identifiers: 'Nernst Effect', Voltage gradient.

A method and apparatus for locating and evaluating geothermal sources of energy are described. Rather than drilling many trial boreholes and recording subsurface temperatures, the invention makes use of a natural phenomenon known as Nernst Effect. It is believed that a given geothermal heat flux eminating vertically through the earth to the surface subjected to the earth's natural magnetic field produces a voltage gradient of a given magnitude in the earth and that this gradient is reflected in an electrostatic voltage gradient of equal magnitude above the earth's surface. The method of the invention calls for the sensing or detecting of such electrostatic voltage gradients by a probe mounted on a suitable vehicle, the recording of the voltage gradients noting the relative location on the earth's surface in the test area of such detection, and the subsequent evaluating of the recorded gradients preferably by geographically plotting the readings on a map at the points recorded to locate the geothermal source of the greatest commercial potential. (Sinha - OEIS)
W76-08204

UNDERGROUND DETENTION FOR STORM OVERFLOWS.
For primary bibliographic entry see Field 8G.
W76-08234

ABOUT THE PROBLEM OF DIRECT RUNOFF DETERMINATION BY SEPARATION OF THE HYDROGRAPH COMPONENTS (K OTAZKE URCENIA PRIMAEHO ODTOKU SEPARACIOU PRIETOKOVYCH VLN),
For primary bibliographic entry see Field 2A.
W76-08238

DRAINAGE RUNOFF OF THE GROUNDWATER UNSTEADY FLOW TO THE DRAINS (DRENAZNY ODTOK PRI NEUSTALENOM PRUDENI PODZEMNEJ VODY K DRENOM),
I. Radcenko.
Vodohospodarsky Casopis, Vol. 21, No. 3-4, p 410-436, 1973. 14 fig, 5 tab, 6 ref.

Descriptors: *Hydrologic aspects, *Groundwater movement, Drains, Drainage, Runoff, Porous media, Filtration, Hydraulics.

The groundwater drainage flow to a system of horizontal parallel drains bedded in a homogeneous and isotropic porous media was studied experimentally. The problem of two-dimensional filtration flow in a vertical plane investigated by the viscous analogue is based on previous work in which the decreasing speed of the depression level vertex point in the midpoint of parallel drain spacing was studied. The relationship between the momentaneous relative height of this vertex point and the total relative groundwater volume runoff with a decreasing depression level is detailed. It is shown that the vertex point drop speed and momentaneous and maximum measuring drainage runoff do not depend on the geometrical shape of the drain but on its filtration active perimeter. The distance of the impermeable layer surface significantly affects the drop speed of the depression level between the drains; and, the closer the drains are bedded to the surface of the impermeable surface the greater the retarding effect of the impermeable layer surface which then cannot be considered as negligible. (Sandoski-FIRL)
W76-08239

TOWN HALTS INFILTRATION.
For primary bibliographic entry see Field 5D.
W76-08257

TRANSIENT FREE SURFACE FLOW TO A WELL: AN ANALYSIS OF THEORETICAL SOLUTIONS,
Centro di Ricerca IBM di Venezia (Italy).
For primary bibliographic entry see Field 2F.
W76-08333

HYDROGEOLOGY OF THE SOUTH FORK OF LONG ISLAND, NEW YORK,
Wisconsin Univ. Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W76-08347

ATTITUDES AND PUBLIC PARTICIPATION ON THE HIGH PLAINS TOWARD GROUNDWATER PLANNING AND MANAGEMENT INSTITUTIONS,
Texas Tech Univ., Lubbock. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W76-08375

STAFFLINERS PREVENT CONTAMINANTS FROM POLLUTING GROUND WATER AT INDUSTRIAL WASTE TREATMENT CENTER.
For primary bibliographic entry see Field 5D.
W76-08466

RADIAL DISPERSION THROUGH ADSORBING POROUS MEDIA,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 5B.
W76-08512

TRANSIENT AQUIFER FLOWS BY CHARACTERISTICS METHOD,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-08513

IMPROVED IMAGE-WELL TECHNIQUE FOR AQUIFER ANALYSIS,
Birmingham Univ. (England). Dept. of Civil Engineering.
Y. K. Chan.
Journal of Hydrology, Vol. 29, No. 1/2, p 149-164, March 1976. 10 fig, 3 tab, 7 ref, 1 append.

Descriptors: *Aquifers, *Pumping, *Boundaries(Surfaces), *Drawdown, *Methodology, Theis equation, Analytical techniques, Observation wells, Hydraulics.
Identifiers: *Method of images, Leaky aquifer, Well functions.

The conventional image-well method does not yield accurate values of drawdown at large values of elapsed time since the commencement of pumping, when the number of images required becomes too large from the computational point of view. A reduction in error can be achieved by selecting an alternative image pattern; the actual form of the pattern depends on the particular boundary conditions. This improved image-well method involves a rearrangement of the image pattern. It overcomes the inherent uncertainty of the conventional method of images as to whether the number of images used is adequate to include a particular range of time. The improved method was tested at length by considering particular examples for non-leaky and leaky aquifers with fully-penetrating constant-discharge wells. Recommendations were made for a more efficient method of evaluating the integral form of the well functions. (Singh-ISWS)
W76-08517

DYNAMIC RESPONSE OF AQUIFER SYSTEMS TO LOCALIZED RECHARGE,
Chile Univ., Santiago. Centro de Recursos Hidraulicos.
For primary bibliographic entry see Field 2F.
W76-08520

TRANSFER OF BORON AND TRITIATED WATER THROUGH SANDSTONE,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-08547

SELECTED HYDROLOGIC DATA, CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-08557

GEOLOGY AND WATER RESOURCES OF MARSHALL COUNTY, SOUTH DAKOTA--PART 1: GEOLOGY AND WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-08558

DESIGN OF GROUND-WATER LEVEL OBSERVATION NETWORK.
Geological Survey, Reston, Va.
Open-file report 76-165, March 1976. 6 fig, 12 tab, 12 ref, 5 append.

Descriptors: *Groundwater resources, *Project planning, *Foreign projects, *Observation wells, *Analytical techniques, Management, *Water levels, *Network design, Evaluation, Systems analysis, Aquifers.
Identifiers: *Israel, Groundwater levels.

In January 1971, a cooperative study was initiated by the Hydrological Service of Israel and the U. S. Geological Survey to develop concepts and systems analytic techniques for the design of groundwater data collection systems with the objective of providing hydrologic information for planning and managing water resource systems. This report summarizes the results of the study which was completed in January 1972. While some of the results pertain specifically to the data program of the Hydrological Service of Israel, the analytic techniques of design developed are quite general and are not restricted to problems in Israel. (Woodard-USGS)
W76-08563

AMINO ACIDS AND GASES IN SOME SPRINGS AND AN OIL FIELD IN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. B. Rapp.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 227-232, March-April 1976. 1 fig, 2 tab, 10 ref.

Descriptors: *Groundwater movement, *Water analysis, *Amino acids, *Gases, *Oil reservoirs, Oil industry, Organic matter, Movement, Analytical techniques, Oil industry, *California.

Samples of water and gas were collected from six springs and two wells in the Upper Cretaceous Great Valley sequence and Franciscan Formation underlying the Coast Range of northern California and from four oil wells penetrating Tertiary sedimentary rocks in the Kettleman North Dome oil field. Comparison of the dissolved free amino acid compositions of the waters from the two locations show overlapping ranges with many more similarities than differences. The detection of nonprotein amino acids indicates the protein degradation is partly chemical rather than strictly biological. Other low molecular weight degradation products (methane, ethane, nonvolatile organic acids, and other organic chelating agents) were found. This may be one mechanism for the transportation of organic matter from the source rocks to the reservoir rocks of an oil deposit. (Woodard-USGS)
W76-08568

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN BRAZORIA, FORT BEND, AND WALLER COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
W. L. Naftel, K. Vaught, and B. Fleming.
Texas Water Development Board, Austin, Report 201, March 1976. 89 p, 3 fig, 12 tab, 3 ref.

Descriptors: *Hydrologic data, *Groundwater resources, *Water levels, *Chemical analysis, *Drillers logs, Texas, Well data, Aquifer characteristics, Water quality, Water chemistry, Basic data collections.
Identifiers: *Brazoria County(Tex), *Fort Bend County(Tex), *Waller County(Tex).

Reports describing the groundwater resources of Brazoria, Fort Bend, and Waller Counties, Texas, were prepared and published in 1973, 1972, and 1969, respectively. Sandeen and Wesselman (1973), in describing the resources of Brazoria County, tabulated records of wells, drillers' logs, water-level measurements, and chemical analyses gathered during the course of this study. This report presents data (1966-74) collected since the investigation by Sandeen and Wesselman (1973) and updates records tabulated by Wesselman (1972) in Fort Bend County and by Wilson (1969) in Waller County. These records are being collected in cooperation with the Texas Water Development Board to evaluate the groundwater resources of the greater Houston-Galveston region. (Woodard-USGS)
W76-08569

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN HARRIS AND GALVESTON COUNTIES, TEXAS, 1970-74,
Geological Survey, Austin, Tex.
W. L. Naftel, K. Vaught, and B. Fleming.
Texas Water Development Board, Austin, Report 203, March 1976. 170 p, 2 fig, 8 tab, 9 ref.

Descriptors: *Hydrologic data, *Groundwater resources, *Water levels, *Chemical analysis, *Drillers logs, Texas, Well data, Aquifer characteristics, Water quality, Basic data collections, Water chemistry.
Identifiers: *Harris County(Tex), *Galveston County(Tex).

The collection of hydrologic data in Harris and Galveston Counties, Texas, was begun by the U. S. Geological Survey in 1929 and 1938, respectively. The current data-collection program is in cooperation with the Texas Water Development Board and the cities of Houston and Galveston. The data-collection program consists of an inventory of new large-capacity and other selected wells, the collection of water samples from wells for chemical analyses, an inventory of groundwater pumpage, water-level measurements in observation wells, pumping tests on large-capacity wells and a compilation of information on land-surface subsidence. Also included are drillers' logs, water-level measurements, and chemical analyses of groundwater collected during the period 1970-74. Additional information on the geology and hydrology of the area may be found in publications listed under 'Selected References.' (Woodard-USGS)
W76-08570

ARTIFICIAL-RECHARGE EXPERIMENTS IN THE ALLUVIAL AQUIFER SOUTH OF FOUNTAIN, EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
O. J. Taylor.
Colorado Water Conservation Board, Denver, Water Resources Circular No 31, 1975. 28 p, 9 fig, 4 plates, 5 tab, 5 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Pit recharge, *Water spreading, *Colorado, Alluvial aquifers, Ponds, Aquifer characteristics, Irrigation, Underground storage, Water wells, Well data, Hydrologic data, Groundwater availability.
Identifiers: El Paso County(Colo), *Groundwater management.

Artificial recharge experiments were conducted in the alluvium along Fountain Creek and south of Fountain, Colo. The saturated thickness of the sand and gravel aquifer ranges from 0 to 34 ft. The transmissivity of the aquifer ranges from 0 to 40,000 sq ft per day. The water table slopes downstream indicating a southerly direction of groundwater movement. Five artificial recharge pits were excavated in the unsaturated zone above the alluvial aquifer. Each pit site was instrumented to measure inflow, stage fluctuations, and water-table fluctuations. The 15 experiments, each of approximately 12-days' duration, indicated that artificial recharge varied with pond stage. The average adjusted artificial recharge rate for the five pits ranged from 0.1 to 4.7 feet per day. The annual amount of recharge from operation of the five pits was estimated as 16,000,000 cu ft. Observed transmission losses in the canal system indicate that the alluvial aquifer is also recharged through the present irrigation practices. Other promising locations for artificial recharge pits are in coarse material in the relatively thick unsaturated zone above the aquifer. Another advantage of artificial recharge in this area is that it would delay the loss of recharged water to underflow or flow from the aquifer to Fountain Creek. Large-capacity wells in this aquifer yield as much as 2.78 cfs and could be used to withdraw the water stored in the alluvial aquifer. (Woodard-USGS)
W76-08571

PLUTONIUM RADIONUCLIDES IN THE GROUNDWATERS AT ENEWETAK ATOLL,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W76-08607

EXIT OF GROUND WATERS ON DRAINAGE BOUNDARIES,
Ebasco Services Inc., New York.
For primary bibliographic entry see Field 2F.
W76-08750

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF PINYON-JUNIPER REMOVAL ON NATURAL RESOURCE PRODUCTS AND USES IN ARIZONA,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary, M. B. Baker, Jr., P. F. O'Connell, T. N. Johnsen, Jr., and R. E. Cambell.
Research Paper RM-128, October 1974. 28 p, 12 fig, 9 tab, 78 ref.

Descriptors: Pinyon pine trees, Juniper trees, Watersheds(Basins), *Arizona, *Water yield improvement, *Forest management, Multiple purpose, Natural resources, Land use, *Watershed management, Forest watersheds.
Identifiers: Beaver Creek Project(Ariz), Mogollon Rim(Ariz), *Pinyon juniper type.

Results from six treated and control watersheds, along with other results from southwestern pinyon-uniper watersheds, suggest that: (1) mechanical methods of pinyon-juniper removal are not likely to increase water yield; (2) removal of pinyon-juniper overstory by herbicides can increase water yield; (3) there has been no statistical verification of changes in flood peaks or water quality due to treatment; (4) herbage yields increase after virtually all pinyon-juniper treatments, but potential livestock carrying capacity varies greatly due to differences in plant composition; (5) the response by deer to these treatments is, on the average, neutral; (6) the more successful conversion projects just about break even from a benefit-cost standpoint under 1972 economic conditions. (Forest Service)
W76-08108

MULTIPLE USE EVALUATIONS ON PONDEROSA PINE FOREST LAND,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-08109

PINYON-JUNIPER CONTROL--DOES IT PAY,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-08110

LAND USE AND WATER QUALITY IN NEW YORK RIVERS,
Cornell Univ., Ithaca, N. Y. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08133

CHANGE IN YIELD OF WATER FOLLOWING A BUSHFIRE IN A FOREST OF EUCALYPTUS REGNANS,
Melbourne and Metropolitan Board of Works (Australia).
K. J. Langford.
Journal of Hydrology, Vol. 29, No. 1/2, p 87-114, March 1976. 9 fig, 9 tab, 27 ref.

Descriptors: *Forest fires, *Hydrologic aspects, *Forests, *Australia, *Water yield, Streamflow, Canopy, Fog, Statistical methods, Transpiration.
Identifiers: *Bushfire, *Yield changes, *Fogdrip, *Canopy interception, *Eucalyptus regnans, Leaf water potential, Non-parametric statistical methods.

The hydrological changes following regeneration by fire of forests of Eucalyptus regnans were analyzed in detail using non-parametric statistical methods. The streamflow data showed that three

five years after the fire the flows started declining below the levels prevailing before the fire. The verage annual reduction in flow over the 163-sq m study area for a 21-year period was 35,000 M1 r 24% of the average streamflow before the fire. Ieasurements of fogdrip and canopy interception nowed that those processes could not be the sole ause of the reduction in flow. A difference in anspiration is the most likely cause. Since E. egnans is one of the world's tallest hardwood spees, the height of the mature trees and consequent w leaf water potential could be increasing the omatal resistance to the diffusion of water apor; difference in transpiring biomass and energy exchange within the canopy could also cause nportant differences between the water consumption of mature and regrowth forests. (Roberts ISWS)
V76-08349

IRST-YEAR WATER YIELD INCREASE AFTER FOREST CUTTING: AN ALTERNATIVE MODEL,
Forest Service (USDA), Athens, Ga. Forestry Sciences Lab.
. W. McMinn, and J. D. Hewlett.
ournal of Forestry, Vol. 73, No. 1, p. 654-655, 975. 4 ref.

Descriptors: *Watersheds(Basins), *Water yield, *Model studies, *Forest management, *Cutting management, Vegetation effects, Evapotranspiration, Forest watersheds, Evaporation.

A simple, linear model using data on differences in slope, aspect, climate, and vegetative conditions is useful within the usual range of heavy stand density reductions, but a non-linear model logically consistent over a range of possible forest-cover removals is derived. Responses of total evapotranspiration rates to forest cover changes indicate that soil evaporation is reduced by even limited cutting. Small reductions in net evapotranspiration increase net water yields. When less than 10% of the stand is removed, increases cannot be detected by hydrological methods, and water yield responses are not linear. The general model should be used cautiously in cases of patch clearcutting, strip cutting, or single tree selection where a substantial basal area is removed, but should be satisfactory where a small percentage of the basal area is removed. The model provides logical predictions over the entire range of the independent variable and is so flexible that other curve forms will only require new estimates of parameters rather than new algebraic forms. A series of curves passing through zero but ranging from 25-100% reduction is basal area should result. (Buchanan-Davidson--Wisconsin)
W76-08362

URBAN HYDROLOGY FOR SMALL WATERSHEDS.
Soil Conservation Service, Upper Darby, Pa. Engineering Div.
For primary bibliographic entry see Field 4D.
W76-08509

NONPARAMETRIC STATISTICAL ANALYSIS OF ANNUAL PEAK FLOW DATA FROM A RECENTLY URBANIZED WATERSHED,
Mount Rogers Planning District Commission, Marion, Va.
T. R. Lazaro.
Water Resources Bulletin, Vol. 12, No. 1, p 101-107, February 1976. 4 tab, 6 ref.

Descriptors: *Statistical methods, *Land use, *Peak discharge, *Maryland, River basins, Watersheds(Basins), Analysis, Rainfall intensity, Urban hydrology, *Urbanization.
Identifiers: *Nonparametric statistical analysis, Central tendency, *Maximum annual peak flow series, *Patuxent River basin(Md), Northeast Branch of the Anacostia River(Md), Wilcoxon test, Peak flow data, Rainstorms.

Annual maximum peak flow data for the Northeast Branch Basin, a recently urbanized Washington, D.C., suburban watershed, were analyzed in order to demonstrate the feasibility of a nonparametric statistical application in investigating the hydrologic impact of the rapid land use change accompanying intense urbanization. Annual peak flow data from the Patuxent Basin above Unity, Maryland, a rural watershed in close proximity to the study area, were compared to data from the Northeast Branch for the same period utilizing the Wilcoxon matched-pairs signed-ranks test. A change in central tendency of each series was noted at the 0.01 significance level; however, the change was negative in the rural basin and positive in the urbanized Northeast Branch Basin. This central tendency change was considered indicative of an average decrease in the size of rainstorms producing annual maximum peak discharges. Rainstorm data from the Northeast Branch Basin were divided into two equal periods (before urbanization and after) and the Wilcoxon test was applied. It was found that rainstorms producing maximum annual peak discharges in the urbanized period were indeed smaller than those in the prior period (0.01 level of significance); however, larger annual peaks were produced. It was concluded that nonparametric statistical methods could be used readily with conventional methods to isolate and clearly analyze the various problems in an actual urban hydrologic study. (Roberts-ISWS)
W76-08522

INVESTIGATION OF ROADWAY DRAINAGE AS RELATED TO THE PERFORMANCE OF FLEXIBLE PAVEMENTS,
South Carolina Univ., Columbia, Coll. of Engineering.
For primary bibliographic entry see Field 8B.
W76-08534

HYDROLOGY OF THE THREE SINKHOLE BASINS IN SOUTHWESTERN SEMINOLE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-08572

LAKE ERIE AND ITS BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-08723

4D. Watershed Protection

EFFECTS OF PINYON-JUNIPER REMOVAL ON NATURAL RESOURCE PRODUCTS AND USES IN ARIZONA,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-08108

USE AND MISUSE OF THE UNIVERSAL SOIL LOSS EQUATION,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W76-08120

ON-SITE RUNOFF DEPLETION AT THREE IMPOUNDMENTS,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 4A.
W76-08122

MEASURING WATERSHED LAND-USE CHANGES WITH AIRPHOTOS,
Clemson Univ., S. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-08229

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 3 - ANALYSIS OF FLOW MODELS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08280

THE RELATIONSHIP BETWEEN WATERSHED USE AND STREAM WATER QUALITY,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins, and D. C. Mahan.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 424, $4.00 in paper copy, $2.25 in microfiche. Completion Report, Institute of Water Research, Michigan State University, East Lansing, March 1976. 24 p, 1 fig, 9 tab, 17 ref. OWRT A-081-MICH(1). 14-31-0001-5022.

Descriptors: *Watersheds(Basins), *Land use, Aquatic environment, Streams, Runoff, *Michigan, Remote sensing, *Land classification, Watershed management, Aerial photography, *Water quality.
Identifiers: *Augusta Creek(Mich), Trout streams.

Augusta Creek is a small, hardwater, brown trout stream flowing south through parts of Barry and Kalamazoo Counties, Michigan, into the Kalamazoo River. Land use patterns were mainly determined through use of infrared aerial photography. Between 50 and 60% of the land is forested of which two-thirds is deciduous upland forest and one-third forested wetlands. About 30 per cent of the land is used for farming, equally apportioned between pasture and cultivation. The rest of the land (10 to 20%) would be classified as wetlands. The total basal area of trees progressively increased moving back from the stream at both locations. This seems to reflect the fact that along Augusta Creek, and most streams observed locally, the immediate stream-side vegetation is composed mainly of shrubs such as dogwood (Cornus) and willow (Salix) with the larger trees such as Acer and oak (Quercus) usually found some distance back. Though vegetative cover was quite extensive, there was a preponderance of small trees. Preliminary data are presented on particulate organic detritus, weekly temperature records, weekly discharge measurements, and species and number of fish collected. The objective was to characterize the basic land uses within the watershed of a southern Michigan trout stream and to eliminate possible effects of land uses on measured physical and biological stream parameters.
W76-08282

INVESTIGATION OF USE OF SPACE DATA IN WATERSHED HYDROLOGY,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 4A.
W76-08326

FIRST-YEAR WATER YIELD INCREASE AFTER FOREST CUTTING: AN ALTERNATIVE MODEL,
Forest Service (USDA), Athens, Ga. Forestry Sciences Lab.
For primary bibliographic entry see Field 4C.
W76-08362

THE CHERRY CREEK-CASSELMAN RIVER ENVIRONMENTAL IMPROVEMENT PLAN,
Maryland Dept. of Natural Resources, Annapolis.
For primary bibliographic entry see Field 5G.

W76-08384

PREPARATION OF PLANS AND SPECIFICATIONS FOR POLLUTION ABATEMENT ACTIVITIES IN CHERRY CREEK WATERSHED, MARYLAND.
Skelly and Loy, Harrisburg, Pa.; and Zollman Associates, Inc., Baltimore, Md.
For primary bibliographic entry see Field 5G.
W76-08385

MINE DRAINAGE POLLUTION WATERSHED SURVEY, CHERRY CREEK, CASSELMAN RIVER WATERSHEDS, GARRETT COUNTY, MARYLAND.
Skelly and Loy, Harrisburg, Pa.
For primary bibliographic entry see Field 5B.
W76-08386

URBAN HYDROLOGY FOR SMALL WATERSHEDS.
Soil Conservation Service, Upper Darby, Pa. Engineering Div.
Technical Release No. 55, January 1975. 98 p, 14 fig, 7 tab, 29 ref, 5 append.

Descriptors: *Watershed management, *Urban hydrology, *Urban runoff, *Urban drainage, Hydrology, Hydrologic systems, Rainfall-runoff relationships, Runoff coefficient, Soil types, Land use, Surface runoff, Storage requirements, Storm runoff, Stage-discharge relations, Detention reservoirs, Urbanization, Watersheds(Basins), Discharge(Water), Environmental effects, Storm drains, Peak discharge.
Identifiers: *Soil cover complex, *Runoff curve number, Hydrologic soil group, Gutter flow, Runoff reduction, Peak flow reduction.

A guide was presented for estimating the effects of land use changes and structural measures on hydraulic and hydrologic parameters, runoff volume, and peak rates of discharge. Examples were used to demonstrate the proper use on urbanizing areas of the soil-cover complex and associated runoff curve numbers developed earlier by the Soil Conservation Service for rural areas. Advantages and disadvantages of many methods for reducing runoff and delaying the time of runoff were discussed. Appendixes provided classification of hydrologic soil groups and 24-hour rainfall amounts in the United States for various frequencies. (Terstriep-ISWS)
W76-08509

NONPARAMETRIC STATISTICAL ANALYSIS OF ANNUAL PEAK FLOW DATA FROM A RECENTLY URBANIZED WATERSHED,
Mount Rogers Planning District Commission, Marion, Va.
For primary bibliographic entry see Field 4C.
W76-08522

AN OPTIMIZATION TECHNIQUE ADAPTED TO USDAHL-74 REVISED MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2A.
W76-08523

SOIL LOSS FROM ILLINOIS FARMS - ECONOMIC ANALYSIS OF PRODUCTIVITY LOSS AND SEDIMENTATION DAMAGE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
K. Guntermann, M. T. Lee, A. S. Narayanan, and E. R. Swanson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 584, $4.75 in paper copy, $2.25 in microfiche. Illinois Institute for Environmental Quality Document No. 74-62, December 1974. 76 p, 6 tab, append.

Descriptors: *Soil erosion, *Economics, *Farm management, *Illinois, Erosion, Sedimentation, Soils, Erosion control, Erosion rates, Cultivation, Rotations, Crops, Soil stabilization, Economic justification, Net income, Tangible benefits, Agriculture.

The purpose of this project was to estimate the economic costs of erosion and sedimentation. Some studies have estimated the effect of erosion and sedimentation on productivity and net farm income but none has combined these results with the off-site sediment damage costs caused by the erosion after the soil has left the farm site. This project estimated the magnitude of these off-site sediment damage costs and combined them with estimates of the effect of on-site productivity losses on private net income to develop a more comprehensive social measure of the entire problem of erosion and sedimentation. Perhaps the most significant finding to emerge from this research was the very slight effect that erosion had on private net income over a 20-year period and the insignificant effect it had on net land rents beyond 20 years. For 5 of the 6 watersheds studied, the reduction in private net income was generally less than $1 per acre over 20 years except for the use of conventional tillage and up-and-down cultivation, where the reduction occasionally reached $2/acre. For the sixth watershed, where erosion was a severe problem for certain crop management combinations, the reduction in income did reach $10/acre in one case, but was generally small for most other alternatives. This finding has important implications for the treatment of the erosion and sedimentation problem since it means that individual farmer-producers have very little in the way of a private incentive to reduce the erosion problem on their farms. (Sims-ISWS)
W76-08533

WATER YIELD IMPROVEMENT BY VEGETATION MANAGEMENT: FOCUS ON ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W76-08539

WATERSHED SOIL DETACHMENT AND TRANSPORTATION FACTORS,
Agricultural Research Service, Morris, Minn.
For primary bibliographic entry see Field 2J.
W76-08551

WATER QUALITY IN IRRIGATED WATERSHEDS,
California Univ., Riverside. Dept. of Soil Science Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08679

IMPLEMENTATION OF HYDROLOGIC MODELS AT GODDARD SPACE FLIGHT CENTER.
IBM Space Systems Center, Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W76-08745

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ADENOSINE TRIPHOSPHATASE ACTIVITY IN BRAIN, INTESTINAL MUCOSA, KIDNEY, AND LIVER CELLULAR FRACTIONS OF THE RED-EARED TURTLE FOLLOWING IN VITRO TREATMENT WITH DDT, DDD, AND DDE,
Middle Tennessee State Univ., Murfreesboro. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08115

NUTRIENT AND SEDIMENT CHARACTERISTICS OF TILE EFFLUENT IN OHIO,
Ohio State Univ. Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08121

TWO-DIMENSIONAL MATHEMATICAL WATER QUALITY MODEL,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 5B.
W76-08135

EVALUATION OF METHODS FOR PRESERVING THE LEVELS OF SOLUBLE INORGANIC PHOSPHORUS AND NITROGEN IN UNFILTERED WATER SAMPLES,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
E. D. Klingaman, and D. W. Nelson.
Journal of Environmental Quality, Vol. 9, No. 1, p 42-46, 1976. 3 tab, 11 ref.

Descriptors: *Analytical techniques, *Preservation, *Phosphorus, *Nitrogen, *Water sampling, Methodology, Filtration, Agricultural runoff, Freezing, Sediments, Ammonia, Nitrates, *Pollutant identification.
Identifiers: Mercuric chloride, Phenylmercuric acetate.

Because little information is available on preservation of water samples from agricultural runoff for inorganic nitrogen and phosphorus analysis, sample preservation techniques applicable to surface runoff, tile drainage water, and streams were developed. Criteria for selection of preservation techniques include the ability to maintain inorganic nitrogen and phosphorus components within 5% of the initial value, minimal hazard to personnel, and compatibility with field sampling procedures and analytical methods. The best overall technique for preserving samples for phosphorus and nitrogen analysis is storage at subzero temperatures. However, frozen storage may result in low recovery of soluble inorganic phosphorus in samples containing sediment. If a decrease occurs due to freezing, a portion of the water may be filtered before freezing, thus permitting accurate estimates of soluble inorganic phosphorus (SIP). SIP was stabilized by addition of mercuric chloride and storage at 4C, but ammonia and nitrates were not preserved for long periods (12 weeks). Soluble inorganic nitrogen was preserved by addition of phenylmercuric acetate and storage at 4C, but SIP concentrations increased in some samples during storage. Storage at 4C or 23C without addition of a chemical preservative caused large changes in the content of SIP and nitrogen. (Buchanan-Davidson--Wisconsin)
W76-08157

NEW METHODS FOR ECOLOGICAL ANALYSIS OF MICROORGANISMS OF EUTROPHIC WATERS, (IN SPANISH),
Institute National de Limnologia, Santo Tome (Argentina).
F. Emiliani.
Microbiol Esp. 25(3);p 175-178, 1972.

Descriptors: *Pollutant identification, *Methodology, Isolation, *Microorganisms, Ecology, Lakes, Eutrophication, Filters, Sampling, Cultures.

A new, simple culture method for isolation and enumeration of indigenous freshwater microorganisms is described. It employs Millipore filters and lake water as a renewable medium. Within a 160 mm Petri dish, a 100 mm Petri dish bottom is placed. Humidity is maintained by water in the

larger bottom. In the smaller bottom a fritted glass disc acts as a support for a Millipore filter disc, through which a measured amount of lake water has been drawn. Filter-sterilized lake water, introduced into the smaller bottom and renewable periodically, serves as a medium for the aquatic microorganisms during 15-30 days of cultivation.--Copyright 1976, Biological Abstracts, Inc.
W76-08252

DETECTION OF SALTS OF 2,4-D IN AQUEOUS SOLUTION BY LASER RAMAN SPECTROSCOPY,
Kentucky Univ., Lexington. Dept. of Electrical Engineering.
J. M. Reeves, E. B. Bradley, and C. A. Frenzel.
Water Research, Vol. 7, No. 10, p 1417-1429, 1973, 11 fig, 3 tab, 9 ref.

Descriptors: *Analytical techniques, *Spectroscopy, *Pollutant identification, Herbicides, Potassium, Sodium compounds, *2-4-D, Aqueous solutions.
Identifiers: *Laser Raman spectroscopy.

Laser Raman spectroscopy has been used to detect a salt of a herbicide, 2,4-dichlorophenoxy acetic acid, in water solution at concentrations as low as 500 ppm. In this experiment, all spectra were excited with a 50 mW He-Ne gas laser at 6328 angstroms. Lower concentrations should be detectable with a more powerful laser at higher frequency. The Raman spectrum of the powder was substantially different from the spectrum of the pollutant in aqueous solution. The spectrum of the potassium and sodium salts were the same for the powder or aqueous solution. Five strong bands exist in aqueous solution, and four of these bands are detectable at concentrations as low as 500 ppm. The resonance Raman effect is discussed as a possible method for the detection and identification of small optimal concentrations of pollutant in water. (Sandoski-FIRL)
W76-08254

AN IMPROVED METHOD FOR DETERMINATION OF THE CHEMICAL OXYGEN DEMAND WITH POTASSIUM DICHROMATE (COD-METHOD) (EINE VERBESSERTE METHODE ZUR BESTIMMUNG DES CHEMISCHEN SAUERSTOFFBEDARFS MIT KALIUM-DICHROMAT) (COD-METHODE),
D. Maier.
Gas- und Wasserfach, Wasser/Abwasser, Vol. 114, No. 8, p 366-370, 1973. 1 fig, 2 tab, 14 ref.

Descriptors: *Analytical techniques, *Chemical oxygen demand, Groundwater, Surface waters, Sampling, Oxygen, *Pollutant identification.
Identifiers: Potassium dichromate.

An improved method using potassium dichromate for the determination of the chemical oxygen demand of groundwater and surface water samples has been developed. In this process, the water sample to be tested is combined with one gram of mercury sulfate per 50 ml of water, after which 50 ml of chromosulfuric acid are added. The flask then is thermostatized at 140 C for four hours. The test solution is cooled to room temperature, diluted with bidistilled water, combined with two to three drops of ferroin solution, and finally titrated with a standard solution of ammonium-ferrous sulfate until the color shifts from yellow-green across blue-green to reddish brown. The method is suitable from COD determinations within the range of 0.5-200 mg of oxygen per liter. (Nave-FIRL)
W76-08256

MEASUREMENT METHOD FOR DISSOLVED AMMONIA NITROGEN IN WATER (YOZON ANMONIASEI CHISSO NODO SOKUTEIHO),
T. Tamate, H. Nakaya, and A. Tomita.
Japanese Patent Sho 48-11200. Issued April 11, 1973.

Descriptors: *Measurement, *Nitrogen compounds, Methodology, Testing procedures, Colorimetry, Polarographic analysis, *Patents, *Pollutant identification.
Identifiers: *Ammonia nitrogen, Japan.

A patented method was designed to reduce errors in the previous method of measuring ammonia nitrogen residue in liquids using a Nessler reagent and comparing the color of Millon's base with the standard colors of nitrogen solution. Since other substances and color material are dissolved in the test liquid, this measurement method often caused errors. In the new method, an excess but given amount of Nessler reagent is added to the sample liquid and the entire ammonia nitrogen residue in the liquid is made to react. The remaining Nessler reagent concentration is measured by polarography, and thus the concentration of nitrogen residue is indirectly obtained. In using this method, if the nitrogen concentration range is narrow, the Nessler additive may be in a small quantity; however, if the concentration range is broad, the amount of reagent must be large. The reliability of the method is excellent. (Seigle-FIRL)
W76-08261

ABSORPTIOMETRIC DETERMINATION OF IRON WITH T.P.T.Z.,
Water Research Association, Marlow (England).
W. K. Dougan, and A. L. Wilson.
Water Treatment and Examination, Vol. 22, No. 2, p 100-113, 1973. 6 tab, 15 ref.

Descriptors: *Analytical techniques, *Water quality, *Iron, Instrumentation, Measurement, Water quality control, Laboratory tests, *Pollutant identification, Absorption.
Identifiers: *Absorptiometric method, TPTZ.

As demands for better water quality have increased, the need has grown for a convenient and reliable method of measuring down to 0.01-0.05 mg Fe/liter. This design was confined to absorptiometric methods because most water laboratories have the necessary instrumentation. A literature survey indicated that the chromogenic reagent 2,4,6-tri-(2'-pyridyl)-1,3,5-triazin (TPTZ) was suitable; optimum conditions for the use of this reagent were established and the performance of the resulting method determined. Advantages of this method include: good precision derived from the use of TPTZ; rapid and simple performance; and, no interference by substances commonly found in raw and treated waters. (Sandoski-FIRL)
W76-08273

SIMULTANEOUS DETERMINATION OF CU2+, PB2+, CD2+, AND ZN2+ IN FRESH TOWN-WATER BY ANODIC STRIPPING POLARGRAPHY, (IN JAPANESE),
Y. Yamazaki.
Bunseki Kagaku, (Japan Analyst), Vol. 22, No. 6, p 763-770, June, 1973. 9 fig, 6 tab, 13 ref.

Descriptors: *Analytical techniques, Water, Pipes, Polargraphic analysis, Zinc, Lead, Cadmium, Copper, *Pollutant identification, Ions, Separation techniques.
Identifiers: *Anodic stripping polargraphy.

A procedure for the simultaneous determination of Cu+2, Pb+2, Cd+2, and Zn+2 ions in municipal water which has been retained in water pipes for 24 to 72 hours has been developed. The ions are electrodeposited on a Balanced Head Stationary Hanging Mercury Drop Electrode (BHMDE) at -1.5 volt vs. Hg pool for a period of five minutes with stirring at 300 rpm in 0.5 M sodium acetate and 0.1 M potassium tartrate supporting medium. The relationship between the dissolution peak currents and pre-electrolysis potential, the effects of foreign cations on Cd and Pb, and the effects of the surface active substance on the dissolution currents of Cu, Pb, Cd, and Zn were examined. A good linear relationship as obtained by the standard addition method was observed between the concentrations of ions and the wave heights in the range of 0.5 x 10 to the minus 7th power M to 5 x 10 to the minus 7th power M. (Sandoski-FIRL)
W76-08275

A CONTINUOUS METHOD OF MONITORING WATER QUALITY BY CHLORINE CONSUMPTION UNDER ULTRAVIOLET RADIATION. I. DESIGN AND PERFORMANCE TEST OF CONTINUOUS CHLORINE CONSUMPTION METER AND APPLICATION TO RAW WATERS OF A WATER PURIFICATION PLANT, (IN JAPANESE),
T. Okuda, and T. Kobayashi.
Tokyo Kogyo Shikenjo Hokoku, (Report of Government Chemical Industrial Research Inst., Tokyo), Vol. 68, No. 7, p 257-265, July, 1973. 6 fig, 4 tab, 9 ref.

Descriptors: *Analytical techniques, *Water quality, *Ultraviolet radiation, Monitoring, Treatment facilities, Chlorine, Organic compounds, Chemical oxygen demand, Mercury, Chlorination, Irradiation, *Pollutant identification.
Identifiers: Photosensitizers, Lead salts.

A continuous method of monitoring water quality by chlorination consumption under ultraviolet radiation has been developed. Examinations were performed on aqueous solutions of 51 compounds and raw water at a purification plant. Combination of chlorine and ultraviolet light permits far more rapid consumption of chlorine for various organic compounds than does the mere contact of chlorine and organic compounds without light. One disadvantage of using this method is that acetic acid does not consume chlorine even under irradiation. Values were obtained for two groups of compounds, based on the effects of ultraviolet radiation, in terms of COD; only rough differentiation between these two groups was possible. The proportionality and additivity of chlorine consumption data in mixed solutions were obtained only in low substrate concentrations. As the photosensitizers, mercury and lead salts were found to be effective for this method. (See also W72-12652) (Sandoski-FIRL)
W76-08276

A STUDY ON MARINE TRACE ELEMENTS AND CSK STANDARDS, (IN JAPANESE),
Sagami Chemical Research Center, Sagamihara (Japan).
For primary bibliographic entry see Field 2L.
W76-08311

ORGANIC CARBON, PHOSPHORUS AND NITROGEN IN THE WATERS OF THE SEA OF JAPAN, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
S. V. Lyutsarev, and E. A. Romankevich.
Okeanologiya. 15(2), p 261-265, 1975.

Descriptors: Carbon, *Phosphorus, *Nitrogen, Bacteria, Sea water, Pollutant identification, Protozoa, Phytoplankton, Correlation analysis.
Identifiers: *Organic carbon, *Sea of Japan, Bacterioplankton.

Concentrations of dissolved and suspended organic C (Cp and Cb, respectively), P (Pp and Pb, respectively) and suspended organic N (Nb) were determined in 12 seawater samples collected with a 200 l water bottle at a station in the Sea of Japan (June 1972). The weighted mean concentrations for the 0-2000 m layer were: 1.58 mg.l-1 for Cp, 17.9 micrograms.l-1 for Cb, 13.9 micrograms.l-1 for Pp, 0.185 micrograms.l-1 for Pb, 2.7 micrograms.l-1 for Nb, the Cp:Pp ratio was 100:0.9 and Cb:Nb:Pb was 100:14:1. The relationship between Cb and the light attenuation factor epsilon (for the visible part of the spectrum) was described by the equation Cb micrograms.l approx. 170. epsilon m-

1. The Cb concentration maximum in the upper layer was correlated with the maxima of phytoplankton, bacterioplankton and protozoa.--Copyright 1976, Biological Abstracts, Inc.
W76-08313

CORALVILLE WATER QUALITY STUDY, ANNUAL REPORT, WATER YEAR OCTOBER 1, 1974 TO SEPTEMBER 30, 1975,
Iowa University, Iowa City, Inst. of Hydraulic Research.
D. B. McDonald, and M. P. McDonald.
IIHR Report No. 187, February 1976. 80 p, 10 fig, 1 plate, 32 tab, 26 ref. ARMY DACWZ 5-74-C-0007.

Descriptors: *Reservoirs, *Water quality, *Iowa, Rivers, Dams, Pollutants, Water pollution, Agriculture, Nutrients, Groundwater, Geology, Soils, Precipitation(Atmospheric), Runoff, Reservoir operation.
Identifiers: *Coralville Reservoir(Iowa), *Iowa River(Iowa).

Data obtained during the present water year are consistent with the results of earlier studies which indicated that the water quality of the Iowa River and Coralville Reservoir are greatly influenced by two major factors: (1) the intensive agricultural activities in the drainage basin and (2) the hydrological characteristics of the river. In addition, the morphometry and flood control operation of the Coralville Reservoir have a significant effect on the water quality of the Coralville Reservoir and subsequently the Iowa River below the dam. Probably the major factor influencing the water quality of the Iowa River is non-point source pollution from agricultural land. In many instances increased concentrations of several parameters were directly related to increased runoff from the basin. These parameters included turbidity, solids, phosphates, ammonia, total and fecal coliform and fecal streptococcus organisms. In most cases, concentrations of nutrients and bacteria introduced by runoff increased markedly at the beginning of a high flow period and then declined as continued inflow washed these materials from the basin and they became diluted by the high river flows. (Sims-ISWS)
W76-08324

ESTIMATING WATER SALINITY WITH GEOPHYSICAL EARTH RESISTIVITY EQUIPMENT,
Agricultural Research Service, Sidney, Mon.
For primary bibliographic entry see Field 2K.
W76-08332

AN IGNITION METHOD FOR DETERMINATION OF TOTAL PHOSPHORUS IN LAKE SEDIMENTS,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
J. M. Andersen.
Water Research, Vol. 10, No. 4, p 329-331, 1976. 3 tab, 11 ref.

Descriptors: *Phosphorus compounds, *Phosphates, *Lake sediments, Analytical techniques, *Bottom sediments, *Pollutant identification, Phosphorus, Water pollution sources, Inorganic compounds, Silts, Soils, Soil types, Analysis, Chemistry, Instrumentation, Organic compounds, Water quality, Chemicals, Digestion, Humus.
Identifiers: Phosphorus determination, *Ignition method, Sediment samples, Biogenic material, Kajak bottom sampler, Perchloric acid method, Plant material.

A method was described for determination of total phosphorus in lake sediments or biogenic material. The organic matter is destructed by ignition. Material remaining after ignition is boiled in 1 N HCl and orthophosphate determined after dilution. The method generally gave lower results than the perchloric acid digestion method (97.7, 98.7, 94.4, 100.5 and 97.3%) for four sediment samples and one sample of dried leaves. The reproducibility of the ignition method was slightly less than that observed with the perchloric acid method. Recovery after addition of known amounts of hydroxylapatite to the sediment samples was 98.5-102.6%. (Henley-ISWS)
W76-08346

A SIMPLE CONTINUOUS-FLOW RESPIROMETER FOR COMPARATIVE RESPIRATORY CHANGES IN MEDIUM-SIZED AQUATIC ORGANISMS,
Texas Christian Univ., Fort Worth. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08353

DETERMINATION OF TOTAL NITROGEN IN NATURAL WATERS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W76-08355

CHLORINATED PESTICIDES AND POLYCHLORINATED BIPHENYLS IN MARINE SPECIES, OREGON/WASHINGTON COAST, 1972,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
R. R. Claeys, R. S. Caldwell, N. H. Cutshall, and R. Holton.
Pesticides Monitoring Journal, Vol. 9, No. 1, p. 2-10, 1975. 2 fig, 4 tab, 13 ref. NSF 6X28744, NMF N-042-14-72 (N), DHEW ES00040.

Descriptors: *Mollusks, *Crustaceans, *Pesticide residues, *Marine fish, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Oregon, Washington, Coasts, DDE, DDT, Pink shrimp, Columbia River, Estuaries, Rainbow trout, Mollusks, Salmon, Clams, Aroclors, Dieldrin, *Pollutant identification.
Identifiers: Flatfish, Coos Bay(Ore), Rogue River(Ore), Euphausiids, Tillamook Bay(Ore), Yaquina Bay(Ore), Umpqua River(Ore), Chlordane, Thiodan, Newport(Ore).

Chlorinated pesticides and polychlorinated biphenyls were measured in pink shrimp, euphausiids, and flatfish from the Oregon-Washington coast, five bivalve mollusks from five estuaries along the Oregon coast, several fish species from Coos Bay and Columbia River estuaries, and a summer-run of steelhead salmon from the Rogue River. PCBs and p,p'-DDE were found most frequently. Euphausiids and pink shrimp contained about 2 ppb wet-weight DDE and 8 and 25 ppb PCBs, respectively. Offshore flatfish averaged 9 ppb DDE and 29 ppb PCBs. Estuarine mollusks contained about 0.5 ppb DDE. PCB residues were only detected in samples from the Columbia River mouth where average levels were 400 ppb PCBs and 17 ppb DDT. Some Columbia River species contained 38 ppb DDE and 480 ppb PCBs. Rogue River summerrun steelheads had 97 ppb DDE and 125 ppb PCBs. PCB chromatograms of most euphausiids were similar to those of Aroclor 1254. Chromatograms of shrimp and flatfish showed selective metabolism of two compounds in the Aroclor 1254 formulation. Shrimp and flatfish had biphenyls with higher chlorine contents. Polychlorinated biphenyl contamination of the Columbia River was greater than that of adjacent coastal waters. (Buchanan-Davidson--Wisconsin)
W76-08359

MERCURY CONCENTRATIONS IN FISH, NORTH ATLANTIC OFFSHORE WATERS--1971,
National Marine Fisheries Service, Milford, Conn. Milford Lab.
R. A. Greig, D. Wenzloff, and C. Shelpuk.
Pesticides Monitoring Journal, Vol. 9, No. 1, p. 15-20, 1975. 1 fig, 7 tab, 9 ref.

Descriptors: *Mercury, *Marine fish, *Atlantic Ocean, Plankton, Sediments, Invertebrates, Pollutant identification.
Identifiers: North Atlantic Ocean.

Mercury concentrations in groundfish collected from United States waters of the North Atlantic Ocean were determined as part of a program to study effects of chemical contamination on biological marine resources. Mercury levels were measured in muscles and livers of 41 fish species, plankton, sediment, and invertebrates all collected in 1971. The average mercury concentrations were 0.154 ppm in fish muscle and 0.164 ppm in fish liver. Mercury concentrations were usually similar among individuals of most species, but variations were observed in cusk (0.13-1.33 ppm in livers and 0.15-0.59 ppm in muscles) and spiny dogfish (0.14-0.93 ppm). Feeding habits and mercury concentrations could not be correlated. The highest levels were found in the muscles of cusk, spiny dogfish, northern searobin, and striped searobin and the livers of blackbelly rosefish, cusk, northern searobin, and American shad. Similar concentrations of mercury were found in muscles and livers of most species; exceptions were higher levels in muscles of spiny dogfish and livers of blackbelly rosefish, American shad, and Atlantic herring. Invertebrate samples generally contained less than 0.1 ppm mercury. The nine plankton and 10 sediment samples had less than 0.05 ppm. Pandallis shrimp, scallops, and squid usually had levels below 0.05 ppm. (Buchanan-Davidson--Wisconsin)
W76-08360

CONSIDERATIONS OF TESTING THE ACCUMULATION OF PESTICIDES BY MEANS OF ARTIFICIAL FOOD CHAINS,
Hamburg Univ. (West Germany). Institut fuer Hydrobiologie und Fischereiwissenschaft.
K. Lillelund.
Ber Dtsch Wiss Komm Meeresforsch. 23(3), p 308-316, 1974.

Descriptors: *Pesticide residues, *Food chains, *Testing procedures, Pesticide kinetics, Kinetics, Water pollution effects, *Pollutant identification.
Identifiers: Dunaliella, Artemia-Salina, Tilapia-Zillii.

Problems associated with the development of experimental food chains for testing pesticide accumulation are discussed. Attention is directed especially to the ways of accumulation, criteria for selecting organisms for a test chain, structure of a test chain, the basis for the calculation of and definitions for the concentration factors Cw, Cf, Ct, pesticide concentrations for test purposes, duration of tests, kinetics of accumulation, density of algae in cultures, and the physiological conditions of test organisms. As an example, the artificial food chain Dunaliella-Artemia salina-Tilapia zillii is presented.--Copyright 1975, Biological Abstracts, Inc.
W76-08361

ELECTROPHYSIOLOGICAL STUDIES OF MORPHOLINE-IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH) AND RAINBOW TROUT (SALMO GAIRDNERI),
Wisconsin Univ., Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08438

EXPERIMENTAL CONFIRMATION OF THE OLFACTORY HYPOTHESIS WITH HOMING, ARTIFICIALLY IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH),
Wisconsin Univ., Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08439

EFFECTS OF LOW CONCENTRATIONS OF OIL ACCOMMODATED IN SEA WATER ON THE GROWTH OF UNIALGAL MARINE PHYTOPLANKTON CULTURES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W76-08440

CHANGES IN BLOOD CHEMISTRY AND BLOOD CELL MORPHOLOGY IN COHO SALMON (ONCORHYNCHUS KISUTCH) FOLLOWING EXPOSURE TO SUBLETHAL LEVELS OF TOTAL RESIDUAL CHLORINE IN MUNICIPAL WASTEWATER,
Municipality of Metropolitan Seattle, Wash. Water Quality Lab.
For primary bibliographic entry see Field 5C.
W76-08442

THE ACUTE TOXICITY OF DISSOLVED ELEMENTAL PHOSPHORUS TO COD (GADUS MORHUA),
Imperial Chemical Industries Ltd., Bixham (England). Brixham Research Lab.
For primary bibliographic entry see Field 5C.
W76-08450

UPTAKE AND ACCUMULATION OF COPPER AND NICKEL BY METAL TOLERANT STRAINS OF SCENEDESMUS,
For primary bibliographic entry see Field 5C.
W76-08452

THE INFLUENCE OF WATER QUALITY ON ACCUMULATION OF HEAVY METALS IN AQUATIC ORGANISMS,
For primary bibliographic entry see Field 5C.
W76-08456

TOXIC CONSTITUENTS IN PULP MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
J. M. Leach, and A. N. Thakore.
Paper Trade Journal, Vol. 157, No. 41, p 43, October 8, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Pollutant identification, Toxicity, Gas chromatography, Mass spectrometry, Bioassays, Analytical techniques, Fish toxins, Pulp wastes.
Identifiers: Fatty acids, Resin acids.

Research conducted to isloate and identify all the toxic constituents in certain pulp and paper process streams has shown that resin acids and fatty acids are major causes of effluent toxicity. The toxic constituents were concentrated and fractionated primarily by chromatographic techniques. Final characterization of individual toxic components was performed by combination gas chromatography and mass spectrometry. At each stage of the isolation procedure, bioassays were performed on separated and recombined chemical fractions to ensure that the original effluent toxicity was fully accounted for. This analytical method can be used to determine the concentration of individual effluent constituents that are known to be toxic to fish. (Sandoski-FIRL)
W76-08458

DETERMINATION OF TRACES OF CARBON IN SOLID AND LIQUID WASTES OF CHEMICAL PLANTS BY MEANS OF THERMAL CONDUCTIVITY MEASUREMENTS (BESTIMMUNG VON SPUREN KOHLENSTOFF IN FESTEN UND FLUESSIGEN ABFALLSTOFFEN DER CHEMISCHEN INDUSTRIE MIT HILFE DER WAERMELEITFAEHIGKEITSMESSUNG),
Farbwerke Hoechst, Frankfurt am Main (West Germany).
F. Ehrenberger.
Zeitschrift fuer Analytische Chemie, Vol. 267, p 17-21, 1973. 1 fig, 1 tab, 7 ref.

Descriptors: *Pollutant identification, *Waste water treatment, *Industrial wastes, *Thermal conductivity, Analytical techniques, Chemical wastes, Chemical industry, Measurement, Carbon dioxide.

An analytical technique designed for the determination of traces of carbon in solid and liquid wastes of chemical plants is described. In this method, the samples are converted by tube-burning. During the conversion, carbon dioxide is adsorbed on a molecular sieve, and then set free and measured by thermal conductivity. The data are digitally encoded for readout and further processing. (Sandoski-FIRL)
W76-08499

DETERMINING OIL CONTENT, IN WATER.
Netherlands Patent NL 7302932. Issued October 1, 1973. Derwent Netherlands Patents Reports, Vol. U, No. 42, p J1, October, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, *Patents, Oily water, *Oil wastes, Analytical techniques, Measurement, Filtration, *Pollutant identification.
Identifiers: Photoelectric device, Dielectric constant, Polypropylene wool.

A process for determining the oil content in water has been patented. In this method, oil is concentrated by passing a definite amount of water per unit time through a definite surface of a filter material which absorbs or separates the oil. A photoelectric device determines the color change of the oil-absorbing filter material after the passage of the water. The degree of color change is used as a measure of the oil content, or, the dielectric constant of the oil-absorbing filter material can be determined after the passage of the water, and the measurement used to determine the oil content. The water is passed twice through the filter material, polypropylene wool, in opposite flow directions so that the greater part of the rust and solid particles is removed from the filter material, while the oil remains in the filter material. The process is capable of determining oil concentrations even when the oil/water ratio is below 1/100,000. (Sandoski-FIRL)
W76-08501

MERCURY IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-08526

ENVIRONMENTAL MONITORING FROM SPACECRAFT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
R. H. Rogers, C. L. Wilson, L. E. Reed, N. J. Shah, and R. Akeley.
Available from the National Technical Information Service, Springfield, Va 22161, as N75 26466, $3.50 in paper copy, $2.25 in microfiche. Special Report BSR 4183, June 1975. 10 p, 4 fig, 8 ref. NASA NAS5-20942.

Descriptors: *Pollutant identification, *Remote sensing, *Land use, *Drainage area, Lakes, Rivers, Model studies, Maps, Costs, Water quality, Water pollution, Satellites(Artificial), Data processing, Federal Water Pollution Control Act, Computer programs, Analytical techniques.
Identifiers: *LANDSAT, *ERTS.

Section 208 of the Federal Water Pollution Control Act Amendments of 1972 provided the opportunity and funding to fight water pollution through the use of regional water quality planning. A common requirement of the 208 program is to develop a capability of predicting water quality in the rivers and lakes resulting from existing and potential land-use policies. To achieve this capability, the Ohio-Kentucky-Indiana (OKI) Regional Council of Governments is developing a deterministic model capable of predicting sediment and nutrient flow into the waterways. An essential input to OKI's model is an accurate map of land use within the watersheds. This information was obtained by OKI through the machine processing of LANDSAT-1 digital tapes. Computer tabulations were generated to obtain area covered by each of 16 land-use categories within 225 drainage areas. The 16 categories were merged into 10 categories and mapped at a scale of 1 in = 5,000 ft with detail to 1.1 acres for the 2,700-sq mi region. The map products and data were produced within a period of less than 90 days at a cost of $20,000, a significant improvement in dollars and time over conventional mapping techniques. (Sims-ISWS)
W76-08532

REASSESSMENT OF MERCURY IN SURFACE WATER IN THE ADIRONDACK REGION, NEW YORK,
Geological Survey, Ithaca, N.Y.
For primary bibliographic entry see Field 2K.
W76-08554

SELECTED HYDROLOGIC DATA, CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-08557

GEOLOGY AND WATER RESOURCES OF MARSHALL COUNTY, SOUTH DAKOTA--PART 1: GEOLOGY AND WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-08558

DISTRIBUTION AND MOVEMENT OF ZINC AND OTHER HEAVY METALS IN SOUTH SAN FRANCISCO BAY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-08561

WATER QUALITY IN THE MAD RIVER BASIN, HUMBOLDT AND TRINITY COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. H. Fuller.
Available from the National Technical Information Service, Springfield, Va., 22161, as ADAO 23722 , $4.50 in paper copy, $2.25 in microfiche. Water-Resources Investigations 44-75, December 1975. 54 p, 21 fig, 15 tab, 17 ref.

Descriptors: *Water quality, *Pre-impoundment, *Baseline studies, *California, River basins, Water analysis, Chemical analysis, Surface waters, Groundwater, Nutrients, Coliforms, Dissolved oxygen, Trace elements.
Identifiers: *Mad River(Calif).

The Mad River of north-coastal California has been the proposed site of the Butler Valley Dam and Blue Lake Project. This report presents the results of a study of surface-water and groundwater quality in the Mad River basin from 1970 through 1974. The general chemical quality of both groundwater and surface water is acceptable for domestic and industrial uses after limited treatment to remove dissolved iron from the water. Nitrogen, phosphorus, and carbon nutrients were found in the river in quantities sufficient to promote algal growth. These nutrients, when combined with water temperatures reaching 25 deg C

in the summer, could result in algal blooms in the [illegible] reservoir. [illegible] concentrations [illegible] pesticides were [illegible] river sediment or [illegible] and concentrations [illegible] trace metals were [illegible]. Diel studies [illegible] slight dissolved-[illegible] sag at night, near river bottom, which is attributed [illegible] by algae [illegible] with [illegible] Cladophora sp. Diatoms composed most of the phytoplankton population. Fecal coliform counts were less than 20 colonies per 100 millilitres, indicating no significant source of fecal pollution in the reaches of the river studied. (Woodard-USGS)
W76-08562

DATA ON SELECTED LAKES IN WASHINGTON, PART 3,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08564

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 3. KITSAP, MASON, AND PIERCE COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08565

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 4. CLARK, COWLITZ, GRAYS HARBOR, LEWIS, PACIFIC, SKAMANIA, AND THURSTON COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08566

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 5. CHELAN, FERRY, KITTITAS, KLICKITAT, OKANOGAN, AND YAKIMA COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08567

AMINO ACIDS AND GASES IN SOME SPRINGS AND AN OIL FIELD IN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W76-08568

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN BRAZORIA, FORT BEND, AND WALLER COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08569

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN HARRIS AND GALVESTON COUNTIES, TEXAS, 1970-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08570

CHEMISTRY AND EFFECTS OF CHLORINE IN AQUATIC SYSTEMS, A SELECTED, ANNOTATED BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn. Ecological Sciences Information Center.
For primary bibliographic entry see Field 5C.
W76-08592

SAVANNAH RIVER BIOLOGICAL SURVEY, LOWER THREE RUNS.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08593

SAVANNAH RIVER BIOLOGICAL SURVEY.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08594

REFERENCE METHODS FOR MARINE RADIOACTIVITY STUDIES II.
International Lab. of Marine Radioactivity, Vienna (Austria).
IAEA, Vienna, Austria, Technical Reports Series No. 169, 1975. 239 p, 113 ref.

Descriptors: *Analytical techniques, *Radiochemical analysis, Radioisotopes, Ruthenium, Zirconium, Silver, Iodine, Surveys, Pollutant identification, Chemical analysis.

Results are reported of a survey which critically examined the present status of analytical methods for transuranic elements radioruthenium, radiozirconium, radiosilver, and radioiodine. The panel performing the survey felt that it should not attempt to recommend standard methods for the radionuclides in question, but to indicate the advantages and pitfalls in existing analytical methods to assist researchers in judging the suitability of the methods for monitoring and for research. In addition to the above mentioned methods, the volume contains 19 supporting papers to the report. (See also W76-08609 thru W76-08627) (Chilton-ORNL)
W76-08608

QUALITY CONTROL IN RADIOCHEMICAL ANALYSIS,
New York Operations Office (AEC), N. Y. Health and Safety Div.
J. H. Harley, H. L. Velchek, and V. T. Bowen.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 63-68, 1 tab.

Descriptors: *Radiochemical analysis, *Quality control, Radioisotopes, Analytical techniques.

A review of the overall requirements for quality control in the particular case of low level radiochemical analysis is presented. The basic factors affecting the quality of radiochemical analysis are given as (a) the use of proper standards for calibration, (b) the use of proper counter efficiencies and backgrounds, (c) the proper determination of radiochemical recovery, (d) correction of results for analytical blank, and (e) the continual checking of the performance of the overall system for accuracy and precision. (See also W76-08608) (Chilton-ORNL)
W76-08609

DOUBLE-TRACER STUDIES TO OPTIMIZE CONDITIONS FOR THE RADIOCHEMICAL SEPARATION OF PLUTONIUM FROM LARGE SEAWATER SAMPLES,
Woods Hole Oceanographic Institution, Mass.
H. D. Livingston, D. R. Mann, and V. T. Bowen.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p69-76, 2 tab, 11 ref.

Descriptors: *Radiochemical analysis, *Plutonium, *Sea water, *Separation techniques.
Identifiers: Double-tracer studies.

By using two tracers of a single element as yield-monitors, adding one at late steps in a sequential procedure, it is possible to examine the conditions affecting efficiency at each step. This is illustrated in experiments optimizing the procedure for plutonium in seawater, using Pu242 and Pu236 for double tracer studies. Data show that the recovery of plutonium from the seawater increased with the amount of iron carrier used. Plutonium was oxidized to the 4+ state with hydrogen peroxide and adsorbed with high efficiency on anion exchange resin from strong nitric or hydrochloric acid media. Studies of the electroplating method indicated that better recoveries resulted from the use of an ammonium sulphate rather than an ammonium chloride medium with longer plating times and lower current. (See also W76-08608) (Chilton-ORNL)
W76-08610

A PROCEDURE FOR ANALYSIS OF AMERCIUM IN MARINE ENVIRONMENTAL SAMPLES,
Woods Hole Oceanographic Institution, Mass.
R. Bojanowski, H. D. Livingston, D. L. Schneider, and D. R. Mann.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 77-86, 1 fig, 3 tab, 8 ref. AT(11-1)-3563, AT(11-1)-3568.

Descriptors: *Radiochemical analysis, *Americium, *Analytical techniques, Separation techniques.

An alpha-emitting radiotracer, Am243, is used to measure the radiochemical yeild of Am241 separated from a sample. A lanthanide carrier is used in preliminary concentration of americium from sample matrix elements. After the concentration steps, the lanthanide/americium fraction is radiochemically purified by ion exchange from alpha-emitting isotopes of the natural radioactive series. An anion exchange method based on the difference in adsorption from thiocyanate media between americium and the lanthanides is used to separate the americium from the lanthanide carrier. The americium is stripped from the resin with hydrochloric acid and subjected to an additional thiocyanate column treatment. The americium is pure enough at this stage to be electroplated after destruction of residual thiocyanate eluted with americium. The activity of Am241 and the Am243 yield monitor are then measured using a high resolution surface barrier detector. Data are given to show the accuracy and precision of the method and an extensive series of notes discusses the various steps. (See also W76-08608) (Chilton-ORNL)
W76-08611

ISOTOPIC ANALYSIS OF PLUTONIUM IN ENVIRONMENTAL SAMPLES BY ISOTOPE DILUTION MASS SPECTROMETRY,
California Univ., Livermore. Lawrence Livermore Lab.
R. J. Dupzyk, R. D. Carver, and I. A. Dupzyk.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 87.

Descriptors: *Radiochemical analysis, *Plutonium, Spectrophotometry, Analytical techniques, Mass spectroscopy.

A technique is presented with which, using careful attention to cleanliness of chemical operations it is possible to obtain reliable and accurate results for samples containing less than 0.1 picogram of total plutonium. The method has been applied to isotopic analysis of plutonium that was isolated from soils, air filters, seawater, marine organisms, and urine. Origin and size of original sample appear to have little bearing on the accuracy of mass analyses. (See also W76-08608) (Chilton-ORNL)
W76-08612

PROCEDURE FOR PLUTONIUM ANALYSIS OF LARGE (100 G) SOIL AND SEDIMENT SAMPLES,
California Univ., Livermore. Lawrence Livermore Lab.
J. W. T. Meadows, J. S. Schweiger, B. Mendoza, and R. Stone.

In: Reference Methods for Marine Radioactivity Studies II, 1975. p 89-90.

Descriptors: *Radiochemical analysis, *Plutonium, Analytical techniques, Sediments, Soils.

The paper describes a procedure which is in routine usage at Lawrence Livermore Laboratory for the analysis of fall-out levels of Pu in soils and sediments. The procedure involves complete dissolution of the sample. Data obtained by this technique were compared with results obtained by use of a leach technique. For most of the samples, the results using complete dissolution were 30-50% higher than those using the leach method. (See also W76-08608) (Chilton-ORNL)
W76-08613

RADIOCHEMICAL DETERMINATION OF PLUTONIUM IN MARINE SAMPLES BY ION EXCHANGE AND SOLVENT EXTRACTION,
Danish Atomic Energy Commission, Risoe. Research Establishment; and Danish Atomic Energy Commission, Roskilde. Health Physics Dept.
A. Aarkrog.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 91-96, 3 fig, 7 ref.

Descriptors: *Radiochemical analysis, *Plutonium, Sea water, Sediments, Analytical technique, *Solvent extractions, *Ion exchange.

The procedure involves the ashing of solid samples at 600 degrees C, adding Pu236 and iron, mixing of potassium pyrosulphate in the ratio of 3:1 and melting of the mixture. This treatment brings the oxidation stage of Pu to 4+ and all Pu into soluble form. The Pu and iron scavenger are precipitated as hydroxide and then separated on an anion exchange resin. The Pu is extracted with 1-phenyl-3 methyl-4-benzoyl-pyrazolone-5 in xylene and the organic phase containing the Pu is evaporated on a steel planchet, ignited and counted on a silicon surface barrier alpha counter connected to a multichannel analyser. In the case seawater the first step is a coprecipitation with ferrous hydroxide with concentrated ammonium hydroxide. (See also W76-08608) (Chilton-ORNL)
W76-08614

DETERMINATION OF PLUTONIUM IN THE MARINE ENVIRONMENT,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
K. C. Pillai.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 97-105, 6 tab, 26 ref.

Descriptors: *Radiochemical analysis, Radioisotopes, Marine biology, Environmental effects, *Plutonium, Strontium, Ruthenium, Cesium, Cerium, Analytical techniques, *Separation techniques.

Analytical methods for the separation of Pu from marine samples are discussed. These methods involve coprecipitation, complexation, solvent extraction and ion exchange. Samples of seawater collected from the Trombay discharge area in Bombay Harbour were analyzed. Examination of bottom sediments in the bay show that most of the plutonium gets accumulated in the discharge locations and its close neighborhood. Accumulation of Ru106, Ce144 and Cs137 are very high in the benthic organisms, but the levels of plutonium are relatively low. A comparison of the data on sediments and organisms show that sediments play a major role in the removal of plutonium from seawaters. (See also W76-08608) (Chilton-ORNL)
W76-08615

RESULTS OF PLUTONIUM INTERCALIBRATION IN SEAWATER AND SEAWEED SAMPLES,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
R. Fukai, and C. N. Murray.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 107-120, 4 tab, 3 ref, 33 append.

Descriptors: *Radiochemical analysis, *Plutonium, Sea water, Marine algae, *Analytical techniques, Inter-agency cooperation, *Calibration.

The intercalibration exercise was initiated when it became clear that controversial opinion existed among different laboratories concerning the suitable analytical procedures for transuranic elements, especially Pu238 and Pu239. Pu238 and Pu239 was measured in two seawater samples and one marine algae sample by seventeen laboratories from 8 countries and the IAEA International Laboratory of Marine Radioactivity. In spite of the complicated chemical procedures involved in plutonium analysis, the scatter of the reported results was much smaller than that for fission product radionuclides such as strontium 90, ruthenium 106, and cesium 137. On the basis of the results obtained it was suggested that a repeat of this type intercalibration exercise be made in the future with emphasis on the determination of americium 241 and other transuranic radionuclides. (See also W76-08608) (Chilton-ORNL)
W76-08616

METHODS OF RUTHENIUM 106 ANALYSIS IN MARINE ENVIRONMENTAL SAMPLES, - A REVIEW,
Institute of Public Health, Tokyo (Japan). Dept. of Radiological Health.
M. Shiozaki.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 121-136, 2 tab, 53 ref, 1 append.

Descriptors: *Radiochemical analysis, *Spectrophotometry, *Ruthenium, Sea water, Sediments, Biota, Aquatic life, *Reviews.

The paper reviews the various analytical methods in current use for the determination of Ru 106 in seawater, marine biota, and sediments. Comparisons of various methods are made as well as conclusions concerning gamma spectrometry and radiochemical procedures in all three types of samples. An appendix presents procedures which are recommended by the authors. (See also W76-08608) (Chilton-ORNL)
W76-08617

DETERMINATION OF RADIONUCLIDES OF CE, CO, FE, RU, ZN AND ZR IN SEAWATER BY PRECONCENTRATION OF COLLOIDAL MANGANESE DIOXIDE, APPLICATION TO THE DETERMINATION OF LOW LEVEL RUTHENIUM 106,
Commissariat a l'Energie Atomique, Cherbourg (France). Centre de la Hague.
P. Gueguenia, R. Gandon, and Y. Lucas.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 137-145, 3 fig, 3 tab, 9 ref.

Descriptors: *Radiochemical analysis, *Ruthenium, Sea water, Chemical precipitation, Radioisotopes.

The precipitation of manganese dioxide in the seawater medium offers a preconcentration method that is simple and immediately applicable after sample collections. The method can be used for the determination of a number of such trace elements occurring in seawater as cerium, cobalt, copper, iron, nickel, tin, zinc, and zirconium. For ruthenium this method can also be used under the following conditions: for small volumes of seawater heat to 90 degrees C to speed up fixation; for large samples this is impractical and the precipitate should be allowed to be in contact with the solution at room temperature for three weeks. The application of this preconcentration procedure to monitoring situations was tested and proved to be satisfactory. (See also W76-08608) (Chilton-ORNL)
W76-08618

RADIORUTHENIUM IN COASTAL WATERS,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
K. C. Pillai, and N. N. Dey.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 147-154, 7 tab, 8 ref.

Descriptors: *Water pollution, *Radioisotopes, *Sea water, *Water wells, *Ruthenium, Radiochemical analysis, Analytical techniques.

Investigations of the well water and bay water near the Trombay Fuel Reprocessing Plant were made. It was found that the mobile form of ruthenium was present in the well water. 94.98% of the activity in the well water was anionic. The distribution of radioruthenium in seawater, suspended silt, bottom sediments, and organisms collected from areas close to the effluent discharge location showed that only very low levels of Ru106 was found in seawaters while ruthenium in the silt was high. Shore and bottom sediments with high concentrations of radioruthenium were confined to the discharge location. It was determined that about 75% of the radioruthenium in seawater exists in the anionic form and about 25% in the cationic form. (See also W76-08608) (Chilton-ORNL)
W76-08619

A REVIEW OF METHODS FOR THE DETERMINATION OF RADIOACTIVE AND STABLE ZIRCONIUM IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. W. R. Dutton.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 155-162, 3 fig, 1 tab, 59 ref.

Descriptors: *Radiochemical analysis, *Zirconium, Sea water, Radioactive wastes, Fallout, Radioisotopes, Analytical techniques, Water pollution, *Reviews.

The only important radioactive nuclide of zirconium encountered in the marine environment is Zr95. Analytical methods for the determination of this radionuclide which are suitable in the context of radioactive waste disposal are given particular attention in this review. Direct gamma-spectrometric analysis of the dried material is generally suitable in this context but multinuclide analysis of seawaters involves either the processing of large volumes of sample, or the use of complex detection systems, or both. It was concluded that recourse may have to be made to the separation of Zr95 alone. (See also W76-08608) (Chilton-ORNL)
W76-08620

A REVIEW OF METHODS FOR THE DETERMINATION OF RADIOACTIVE AND STABLE SILVER IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. W. R. Dutton.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 163-172, 4 tab, 2 fig, 61 ref.

Descriptors: *Analytical techniques, *Silver, Radioisotopes, *Radiochemical analysis, Spectrophotometry, Sea water, Radioactive wastes, *Reviews.

Only Ag108m and Ag110m are likely to be encountered in the marine environment. Some form of gamma-spectrometry is the preferred technique for the analysis of both of these radionuclides in the context of both waste control and research. Chemical separations are generally not necessary, but can be used if required to increase sensitivity and decrease interference. The determination of stable silver in the marine environment is effected by several techniques, with neutron activation the most popular. (See also W76-08608) (Chilton-ORNL)
W76-08621

A REVIEW OF METHODS FOR THE DETERMINATION OF IODINE-131 IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. W. R. Dutton.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 173-176, 1 tab, 11 ref.

Descriptors: *Radiochemical analysis, *Analytical techniques, *Iodine, Sea water, *Radioisotopes, Spectrophotometry.

For biological materials direct gamma-spectrometric analysis of wet or oven-dried material is satisfactory, producing data with adequate precision down to I131 levels of 0.1 pCi/g or less. Standard methods for the determination of radioiodine in natural waters rely on carrier equilibration, by oxidation to iodate and reduction to iodide, followed by conversion to free iodine and extraction into carbon tetrachloride; the iodine is back-extracted into the aqueous phase and precipitated as silver iodide for subsequent counting. (See also W76-08608) (Chilton-ORNL)
W76-08622

A RAPID METHOD FOR THE DETERMINATION OF RADIOIODINE IN SUSPENDED MATTER AND SEAWATER,
Central Lab. for Radiological Protection, Warsaw (Poland).
S. Wlodek.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 177.

Descriptors: *Analytical techniques, *Spectrophotometry, *Iodine, *Radiochemical analysis, Sea water.

The method measures the inorganic form of iodine and involves the separation of the iodine from other components in the sample by solvent extraction using carbon tetrachloride, and the collection of the iodine on an ion-exchange resin. The form of this resin permits direct measurement of the radioiodine with high sensitivity using beta-spectrometry with anticoincidence shielding. The analysis takes about one hour. (See also W76-08608) (Chilton-ORNL)
W76-08623

A METHOD FOR THE RAPID ENRICHMENT AND DETERMINATION OF SILVER-110M AND IODINE-131 FROM SEAWATER,
Deutsches Hydrographisches Institut, Hamburg (West Germany).
H. F. Eicke.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 179-185, 4 fig, 1 tab, 9 ref.

Descriptors: *Radiochemical analysis, *Silver, *Iodine, Analytical techniques, Sea water.

The seawater to be investigated is slowly drawn off over solid silver iodide, which, to increase the exchange capacity of the surface, is deposited on asbestos fibers. The isotope exchange on AgI permits a relatively rapid concentration an specific selection of Ag-110m from seawater. The time required depends on the quantity of water used for the exchange. The run-through speed was about 200-250 ml/min. The limit of detection was 2 pCi/l using at least 20 litres of seawater. The quantity of water and the measuring time required decrease with higher activities. (See also W76-08608) (Chilton-ORNL)
W76-08624

A STUDY OF THE STABILITY OF SOME RADIONUCLIDES IN SEAWATER,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. W. R. Dutton, R. D. Ibbett, and L. E. Woolner.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 187-211, 17 tab, 3 fig, 8 ref, 2 append.

Descriptors: *Radiochemical analysis, *Ruthenium, *Zirconium, *Cerium, Stability, Analytical techniques, Radioisotopes, Sea water.

For the particular environment investigated there were no significant losses of Ru 106 and Zr 95 in filtered seawater from a variety of containers and at pH levels between 1.8 and about 8 the natural pH of seawater. No suitable storage conditions were established for Ce 144. Two appendix outline the procedures for the determination of Ru 106, Zr 95, and Ce 144 in seawater. (See also W76-08608) (Chilton-ORNL)
W76-08625

INTERCALIBRATION OF METHODS FOR RADIONUCLIDE MEASUREMENTS ON A SEAWEED SAMPLE,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
R. Fukai, and S. Ballestra.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 213-233, 11 tab, 3 fig, 5 ref, 1 append.

Descriptors: *Radiochemical analysis, *Radioisotopes, *Inter-agency cooperation, Aquatic algae, Analytical techniques.

Forty-seven laboratories participated in the intercalibration exercise. Reported results on Sr 90 and Cs 137 were generally comparable but there was a large variation in the results reported on K 40, Ru 106, and Ce 144. The majority of results in the latter group had been obtained using non-destructive gamma-spectrometry with Ge(Li) detectors indicating that emphasis should be placed on control of calibration procedures of counting instruments. Probable concentrations estimated on the basis of statistical treatments of reported results are given for K 40, Sr 90, Ru 106, Cs 134, Cs 137, Ce 144, Co 60, Zn 65, Zr-Ni 95, and Ag 110m. (See also W76-08608) (Chilton-ORNL)
W76-08626

RADIOACTIVITY IN THE HYDROSPHERE RECENT TRENDS IN CZECH STUDIES,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
A. Mansfeld.
In: Reference Methods for Marine Radioactivity Studies II, 1975. p 235-239.

Descriptors: *Radiochemical analysis, *Radioisotopes, Analytical techniques, Radioactivity, Europe.

The Czech study program obtains information on the behavior of radioactive substances in water courses, reservoirs, sources of drinking water and purification plants. The study was directed mainly at the determination of total beta and Sr 90 activity; Ra226 and uranium activities were also measured. Factors that limit both the extent and the quality of work on the behavior of radionuclides in the hydrosphere are the reproducibility and applicability of the results of radiochemical analyses. A review of the state of the art of methods of determination is presented. (See also W76-08608) (Chilton-ORNL)
W76-08627

BIOCHEMICAL STUDIES OF ENTRAINED PHYTOPLANKTON AT THE MORGANTOWN MARYLAND POWER PLANT,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5C.
W76-08642

BASELINE CONCENTRATIONS OF POLYCHLORINATED BIPHENYLS AND DDT IN LAKE MICHIGAN FISH, 1971,
National Water Quality Laboratory, Duluth, Minn.
G. D. Veith.
Pesticides Monitoring Journal, Vol. 9, No. 1, p. 21-29, 1975. 2 fig., 3 tab., 24 ref.

Descriptors: *Baseline studies, *Polychlorinated biphenyls, *DDT, *Lake Michigan, *Fish, Aroclors, Pesticide residues, Legislation, Smelts, Lake trout, Suckers, Carp, Salmon.
Identifiers: Coho salmon, Bloaters.

Organochlorine compounds, especially polychlorinated biphenyls and DDT, in Lake Michigan fish in 1971 were identified and measured quantitatively to establish baselines for predicting trends and gauging legislative impact on lake quality. Thirteen fish species were analyzed. Mean net weight concentrations of polychlorinated biphenyls similar to Aroclor 1254 ranged from 2.7 ppm in rainbow smelt to 15 ppm in lake trout. Polychlorinated biphenyl levels increased with tissue fat percentages and fish size. Polychlorinated biphenyl concentrations varied, limiting usefulness of mean concentrations. DDT concentrations ranged from 1 ppm in suckers to 16 ppm in large lake trout. The ratio of polychlorinated biphenyls to total DDT ranged from 1.3 in redhorse suckers to 7.6 in carp; most ratios were between 1.7-2.8. The most abundant polychlorinated biphenyls were tetra-, penta-, hexa-, and heptachlorobiphenyls; lesser CPB's were present in fish from nearshore areas. Lake Michigan coho salmon contained more polychlorinated biphenyls than those from other Great Lakes. Almost 100% of Lake Michigan large salmon and trout and 50-80% of bloaters contained more polychlorinated biphenyls than FDA tolerance levels. (Buchanan-Davidson--Wisconsin)
W76-08685

MICROBIAL ATP AND ORGANIC CARBON IN SEDIMENTS OF THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-08687

PHOSPHORUS FLUX AND CYCLING IN ESTUARIES,
Smithsonian Institution, Rockville, Md. Radiation Biology Lab.
For primary bibliographic entry see Field 5C.
W76-08689

CAUSES AND PROBABLY CORRECTIVES FOR OXYGEN DEPLETION FISH KILLS IN THE DICKINSON BAYOU ESTUARY: A FIELD STUDY AND SIMPLIFIED ALGAL ASSAY,
Texas Parks and Wildlife Dept., Seabrook. Seabrook Marine Lab.
For primary bibliographic entry see Field 5C.
W76-08690

THE SIGNIFICANCE AND VARIATION OF ATMOSPHERIC NUTRIENT INPUTS IN A SMALL CATCHMENT SYSTEM,
Sheffield Univ. (England), Department of Geography.
R. Cryer.
Journal of Hydrology, Vol. 29, No. 1/2, p 121-137, March 1976. 2 fig, 9 tab, 25 ref.

Descriptors: *Nutrients, *Precipitation(Atmospheric), Peat, *Water quality, Specific conductivity, Calcium, Meteorological data, Streamflow, Sampling, Seasonal Atmosphere, Hydrogen ion concentration, Biochemistry, *Air pollution effects.
Identifiers: *Nutrient input, *Wales, *Atmospheric nutrients, Plant macro-nutrients, Bulk precipitation.

Bulk precipitation and streamflow were sampled for 77 weeks in a 54-haupland peat catchment in Mid-Wales, and seven water quality variables were determined for each sample: specific conductivity and pH, and calcium, magnesium, sodium, potassium and chloride concentrations. Precipitation quality proved to be highly variable from week to week with levels up to ten times the mean value for the period. A seasonal variation in quality was noted, all the variables except Ca(+2) and pH having peak levels in February with below-average values in June to October. The variability in solute levels in precipitation was related to the prevailing meteorological sampling conditions with little success except in supporting the terrestrial source for Ca(+2). Mean solute concentrations in streamwater were higher than in precipitation in every case except for Ca(+2). Occasional individual precipitation samples had higher concentrations than the contemporaneous streamwater samples. Solute rating curves were of very low statistical significance; streamwater solute concentrations were more closely related to solute concentration in the previous week's rainfall. Budget calculations showed that Mg(+2), Na(+), K(+), and C1(-) in bulk precipitation accounted for 51, 62, 63 and 56%, respectively, of the total element output from the catchment in streamflow. (Roberts - ISWS)
W76-08728

5B. Sources Of Pollution

AN OPTIMIZATION MODEL FOR REGIONAL WATER QUALITY MANAGEMENT,
Lehigh Univ. Bethlehem, Pa. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-08104

MARINE ECOLOGY OF THE NORTHERN EUBOEA: I. PRELIMINARY DATA ON THE ZOOPLANKTON AND THE ICHTYOPLANKTON, (IN FRENCH),
Athens Univ. (Greece). Zoological Lab. and Museum.
For primary bibliographic entry see Field 2L.
W76-08106

GROUND WATER FLOW NO LONGER A MYSTERY,
National Water Well Association, Columbus, Ohio.
For primary bibliographic entry see Field 2F.
W76-08114

NUTRIENT AND SEDIMENT CHARACTERISTICS OF TILE EFFLUENT IN OHIO,
Ohio State Univ. Columbus. Dept. of Agricultural Engineering.
T. J. Logan, and G. O. Schwab.
Journal of Soil and Water Conservation, Vol. 31, No. 1, p 24-27, January-February 1976. 2 fig, 4 tab, 12 ref.

Descriptors: *Tile drains, *Nutrients, *Sediments, *On-site investigations, *Ohio, *Drainage systems, Corn(Field), Alfalfa, Fertilizers, Effluents, Agriculture, Pollutant identification, Sampling, Drainage, Path of pollutants.
Identifiers: *Tile effluent, Nutrient losses.

A prominent environmental concern in recent years has been agriculture's contribution to the nutrient enrichment of lakes and streams. The tile effluents were monitored from three small drainage systems - 7 to 10 acres - in central Ohio during 1972 and 1973. Two of the drainages were cropped to corn and received nominal amounts of chemical fertilizer. The third drainage was in continuous alfalfa and previously received applications of dairy manure. Average nitrogen losses were 37, 19, and 0.6 pounds per acre per year. Nitrogen concentrations tended to decrease with time during each growing season. Tile effluent from the alfalfa site had consistently lower nitrogen concentrations. Most of the nitrogen loss was in the nitrate form. Sediment losses averaged 335, 47, and 148 pounds per acre per year. Because of large acreages of poorly drained agricultural land in western and northwestern Ohio and adjoining states, the contribution of nutrient and sediment losses in tile drainage to total losses may be significant. (Singh - ISWS)
W76-08121

THE BALTIC SEA--A SEMI-ENCLOSED SEA, AS SEEN BY THE HYDROLOGIST,
Swedish Natural Science Research Council, Stockholm.
For primary bibliographic entry see Field 2L.
W76-08130

LAND USE AND WATER QUALITY IN NEW YORK RIVERS,
Cornell Univ., Ithaca, N. Y. Dept. of Civil and Agricultural Engineering.
D. A. Haith.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE1, Proceedings Paper 11902, p 1-15, February 1976. 7 tab, 27 ref, 2 append.

Descriptors: *Land use, *Water quality, *Water pollution, *Drainage practices, *New York, Surface drainage, Statistical methods, Estimating, Mathematical studies, Water chemistry, Water control, Nitrogen compounds, Water properties, Phosphorus compounds, Nutrients, Rivers, Waste disposal, Water management(Appliedd, Suspended soilds, Agricultural runoff.
Identifiers: Land-use, *Nonpoint pollution sources, Water quality management, Water quality planning.

The Federal Water Pollution Control Act Amendments of 1972 require that land-use management and control of nonpoint pollution sources be included in areawide water quality planning. At the present time, few tested procedures are available to implement this policy. Statistical techniques, including correlation and regression analyses, offer a promising methodology for the study of land use and nonpoint source impacts on water quality. The methodology has been applied to water quality and land-use data from 20 river basins in New York State. The results indicated that river basin land uses could account for up to 89% of the observed variation in mean river nitrogen concentrations and 63% of the observed variation in mean total suspended solids concentrations. No relationships between phosphorus concentrations and land uses were found in the basins. (Henley-ISWS)
W76-08133

SHOOTING MODELS FOR SALINITY AND COLIFORM,
Texas Univ. at Austin. Dept. of Electrical Engineering.
B. J. Olufeagba, and R. H. Flake.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE1, Proceedings Paper 11939, p 95-109, February 1976. 9 fig, 2 tab, 14 ref, 2 append.

Descriptors: *Mathematical models, *Salinity, *Coliforms, *Estuaries, *Water quality, Mixing, Computer models, Model studies, Bays, Water pollution, Circulation, Currents(Water), Dispersion, Advection, Convection, Waste dilution, *New York.
Identifiers: Shooting models, *Jamaica Bay(NY), Boundary value problems.

A method for solving the water quality models by a shooting technique was presented for Jamaica Bay. The technique exhibited excellent convergence rates for linear problems and generally involved the solution of much smaller linear systems than models utilizing direct finite difference methods. The method, which has been extended to multiconstituent water quality problems, has also been employed in the determination of water quality management policies in Jamaica Bay. A recent study has shown that these shooting techniques may also be employed in solving boundary value problems in which the elliptic operator is approximated with sparse two-dimensional finite difference equations with a considerable reduction in the size of the linear systems to be solved. (Bender-ISWS)
W76-08134

TWO-DIMENSIONAL MATHEMATICAL WATER QUALITY MODEL,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
B. J. Williams, and J. B. Hinwood.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE1, Proceedings Paper 11947, p 149-163, February 1976. 5 fig, 1 tab, 24 ref, 2 append.

Descriptors: *Computer models, *Water quality, *Australia, *Mathematical models, Biochemical oxygen demand, Dissolved oxygen, Organic matter, Water pollution, Model studies, Computers, Coliforms, Nitrates, Nutrients, Pollutants, Water chemistry, Water analysis, Hydrodynamics, Dispersion, Topography, Suspended solids, On-site data collections, Forecasting, Tides, Velocity.
Identifiers: *Water quality model, *Westernport Bay(Australia), Computational techniques, Pollutant transport model, Organic carbon.

A large-scale computer model of water quality in Westernport Bay, Australia, was described. Comparison was made between model predictions and field measurements. The model consisted of four submodels, i.e., the Topographic Model, Hydrodynamic Model, Pollutant Transport Model, and the Chemical Kinetics and Interaction Model. The following physical variables were provided as output at gridpoints throughout the bay-interpolated depths, tide heights, and velocity components. The movement of nonreacting tracer particles was computed. Concentrations of the following chemicals and other materials, averaged over depth, were determined: (1) dissolved oxygen deficit, (2) organic carbon, (3) BOD, (4) nitrogen as organic matter, (5) nitrate and ammonia, (6) coliforms, (7) conservative pollutants, and (8) suspended solids. Bulk water temperature was computed also. Computational techniques and experiences with the model were described and proposals for future development were examined. (Henley-ISWS)
W76-08135

NITROGEN AND PHOSPHORUS LOSSES FROM WINTER DISPOSAL OF DAIRY MANURE,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W76-08159

DISTRIBUTION OF PLUTONIUM IN SOIL PARTICLE SIZE FRACTIONS OF LIQUID EFFLUENT-RECEIVING AREAS AT LOS ALAMOS,
Los Alamos Science Lab., N. Mex.
J. W. Nyhan, F. R. Miera, and R. J. Peters.
Journal of Environmental Quality, Vol. 5, No. 1, p 50-56, 1976. 5 fig, 4 tab, 16 ref. ERDA W-7405-Eng. 36.

Descriptors: *Radioactive waste disposal, *Soils, *Particle size, *Effluents, *Distribution patterns, *New Mexico, Alluvium, Depth, Soil texture, Outlets, Intermittent streams, Cation exchange, Path of pollutants.
Identifiers: *Plutonium, Los Alamos(NM).

Alluvial soils of three effluent-receiving canyons at Los Alamos, New Mexico, were sampled to determine plutonium-238 and plutonium-239,240 distributions in soil size fractions as a function of soil depth, distance from waste outfall, and soil physical-chemical properties. Plutonium concentrations in less than 53 micrometer soil fractions were ten-times higher than in 2-23 mm fractions, but plutonium concentration was greatest in fractions larger than 105 micrometers; concentrations decreased curvilinearly with distance from outfalls and with soil depth. Smaller fractions had seven-times more surface area and three-fold more cation exchange capacity than larger fractions; plutonium concentrations in the size fractions correlated with surface area. Most Mortandad Canyon soils samples showed an approximate doubling of the Pu ratio with increased soil depth and within 40 meters of the outfall. Smaller fractions had a two-fold higher average ratio than larger fractions. Plutonium distribution in soil size fractions is discussed as a function of changing isotopic composition of liquid wastes added to the canyons, movement of soil and Pu in these intermittent streams, and potential isotopic differences in Pu behavior. (Buchanan-Davidson--Wisconsin)
W76-08160

POLLUTION OF SURFACE IRRIGATION WATERS BY PLANT PATHOGENIC ORGANISMS,
Nebraska Univ., Lincoln.
J. R. Steadman, C. R. Maier, H. F. Schwartz, and E. D. Kerr.
Water Resources Bulletin, Vol. 11, No. 4, p 796-804, August 1975. 3 fig, 3 tab, 20 ref. OWRT B-021-NEB(2)

Descriptors: Water resources, *Irrigation, *Water pollution, *Bacteria, *Surface waters, Fungi, Nematodes, Epidemiology, Sampling, Agriculture, *Nebraska.
Identifiers: *Phytopathogenic bacteria, Phytopathogenic fungi, Phytopathogen dissemination, *North Platte Project(Neb).

Systematic sampling of waterways and irrigation runoff from agricultural lands in the North Platte Project of Nebraska in July and August of 1972-1974 demonstrated that phytopathogenic organisms were disseminated. The organisms monitored included the bean common blight bacterium Xanthomonas phaseoli, the bean white mold fungus Whetzelinia sclerotiorum and various nematodes. Although many types of nematodes often were recovered from irrigation water, Heterodera sp. cysts which cause significant disease problems in the valley were found infrequently. Patterns of movement of the bacterial and fungal organisms were correlated with previous or current season infection of bean plants. The short-term survival of X. phaseoli in sterile deionized water may explain the detection of this organism only in runoff or ditches receiving runoff from common blight infected bean fields. Sclerotial bodies of W. sclerotiorum remained viable for at least 10-21 days in flowing water and were found throughout the irrigation waterways. Irrigation of beans with contaminated water can result in both common blight and white mold diseases. Dissemination of phytopathogenic organisms in irrigation reuse systems as well as agricultural land runoff should be considered in irrigation planning and system design. (Bell-Cornell)
W76-08230

SESSILE ANIMALS ON TAR GLOBULES IN THE WATERS AROUND THE RYUKYU ISLANDS, (IN JAPANESE),
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 2L.
W76-08232

DISTRIBUTION OF CHAETOGNATHA AND BIOMASS OF THE ZOOPLANKTON IN THE WESTERN PART OF THE TROPICAL ATLANTIC, DURING JULY AND AUGUST 1968, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-08245

TOWN HALTS INFILTRATION.
For primary bibliographic entry see Field 5D.
W76-08257

INFLUENCE OF THE LOCAL PRECIPITATION QUANTITY ON THE LOADING OF WATER BODIES WITH MIXED WATER (DER EINFLUSS DER OERTLICHEN NEIDERSCHLAGSHOEHE AUF DIE BELASTUNG DER GEWAESSER MIT MISCHWASSER),
P. G. Brunner.
Berichte der Abwassertechnischen Vereinigung, No. 26, p 163-172, 1973. 8 fig, 5 ref.

Descriptors: *Hydrological aspects, *Precipitation intensity, Bodies of water, Sewers, *Storm runoff, Pollutants, Overflow, Precipitation(Atmospheric), Storm water, Europe, Cities.
Identifiers: Dry-weather runoff, Germany.

The influence of local precipitation quantity on the loading of mixed water bodies was studied partly on the basis of systematic pluviographic measurements conducted in the German cities of Ingoldstadt, Munich, and Mittenwald. Increases in the quantity, duration, and frequency of the loading (composed of surface storm runoff, deposits in sewers, and dry-weather runoff) with increasing precipitation quantity were observed. Results indicate a rapid increase in the rate of pollutant deposition with increasing deposition time. Also, for high critical precipitation quantities over 10 liters per second, climatic factors had little effect on overflows caused by storm water over extended periods of time. (Takacs-FIRL)
W76-08258

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III - VOLUME 1--DRY WEATHER FLOWS,
Texas Tech Univ., Lubbock. Water Resources Center.
M. Gibson, R. H. Ramsey, B. J. Claborn, R. M. Sweazy, and D. M. Wells.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 425, $5.00 in paper copy, $2.25 in microfiche. Final Report WRC-75-2, December 1975. 71 p, 3 fig, 25 tab, 29 ref, append. OWRT B-177-TEX(2).

Descriptors: Dry seasons, *Model studies, *Texas, Storms, *Urban runoff, *Water pollution sources, *Water quality, Cities, Biochemical oxygen demand, Chemical oxygen demand, Sampling, Watershed management, *Storm runoff, Suspended solids, Nitrates, Phosphates, Urbanization.
Identifiers: *Dry weather flows, *Lubbock(Tex), Semi-arid areas, Total solids, Flow volumes, Urban watersheds.

Water samples and flows were obtained from storm events and dry weather flows occurring on a 1,499 acre urban watershed in Lubbock, Texas over a nine month period from September 1974 through May 1975. The watershed was monitored daily by an automatic sampler, automatic flow recorder, and raingages. Hourly flow samples from 59 precipitation events and 199 dry weather flows were combined into daily composites which were analyzed for COD, BOD, Total Solids, Total Suspended Solids, Orthophosphate and Nitrate. Four predictive flow models were selected to generate data to be compared to actual observed flow data. Criteria for selecting the models used in the analyses were the time, money, and effort required for implementation. The predictive flow models utilized were the rational method; the Viessman and Miller method; the Viessman, Keating, and Srinivasa Method, and the British Road Research method. Using three storms of varying characteristics, the total runoff volume and peak flows from the predictive models were compared to the observed total runoff and peak flows in each case. The results from this small sample were inconclusive. (See also W76-08279 thru W76-08281)
W76-08278

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 2, IMPACTS OF DUST STORMS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08279

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 3 - ANALYSIS OF FLOW MODELS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 2A.
W76-08280

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 4 - PROJECT SUMMARY,
Texas Tech Univ., Lubbock. Water Resources Center.
D. M. Wells, R. M. Sweazy, B. J. Claborn, and R. H. Ramsey.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 428, $4.50 in paper copy, $2.25 in microfiche. Final Report WRC-75-4, December 1975. 47 p, 14 fig, 15 tab, 7 ref.OWRT B-177-TEX(6).

Descriptors: *Urban runoff, *Urban hydrology, *Water quality, *Water pollution sources, *Texas, *Model studies, Watershed management, Cities, Urbanization.
Identifiers: Lubbock(Tex), Semi-arid areas, Model analysis.

This report summarizes the urban runoff studies that were conducted in Lubbock, Texas for the period from July 1, 1969 through the date of this report under the sponsorship of the Office of Water Research and Technology, Texas Tech University, and the City of Lubbock. The three phases of the study during this period are reviewed and the major findings discussed. General conclusions drawn from those studies conducted in this semi-arid area were: that the quality of urban runoff is extremely variable and highly unpredictable; that runoff quality improves with duration of runoff; that the first-flush phenomenon that occurs in urban runoff has some validity but has limited practical value in alleviating water quality

problems associated with urban runoff. On large watersheds the first-flush from the uppermost areas coincides with cleaner flows from the lower sub-areas and results in a more uniform concentration of pollutants through a longer time span; and that the water quality impact of runoff from residential areas does not appear to be as great as much of the runoff quality data would indicate it to be, since no fish kills have been observed in the playa lakes into which this runoff flows. (See also W76-08278)
W76-08281

DENSE EFFLUENT DISPERSION IN A STREAM,
Oregon State Univ., Corvallis. School of Oceanography.
H. Crew, and R. O. Reid.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol. 102, No. EM1, Proceedings Paper 11915, p 77-88, February 1976. 7 fig, 4 ref, 2 append. (Subcontract from Dow Chemical Company). OWRT 14-01-0001-2169.

Descriptors: *Effluents, *Dispersion, Hydrodynamics, Waste disposal, *Numerical analysis, Analytical techniques, Water pollution, Diffusion, Buoyancy, Flow, Advection, Density, Equations, Model studies, *Path of pollutants.
Identifiers: *Density plume, Navier-Stokes equations.

A plume of effluent issuing from a port bends away from the vertical due to advection by the stream current, while its cross-sectional area increases due to turbulent diffusion. The axis of the plume becomes horizontal some distance downstream from the port, and farther downstream the plume axis tilts downwards and constitutes the far field region. Convective circulation and buoyancy effects govern the motion in this region. The Navier-Stokes equations and advective-diffusion equation for density were solved numerically for the fields of flow and density downstream of the discharge port. The numerical results appeared to be satisfactory solutions of the governing equations and boundary conditions for a broad range of effluent densities. While the model did not attempt to simulate dispersal in a natural stream, it did so to the extent that the stream meets the conditions imposed by the assumptions made in formulating the equations and boundary conditions. (Singh-ISWS)
W76-08316

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. VII, A HINDCAST,
New York City-Rand Inst., N.Y.
J. J. Leendertse, and S-K. Liu.
Report R-1774-NYC, July 1975. 99 p, 13 fig, 10 ref, 8 append.

Descriptors: *Water quality, *Urban runoff, *Estuarine environment, *Model studies, *New York, Computer models, Mathematical models, Coliforms, Pollutants, Path of pollutants, Sewage bacteria, Bays, Estuaries, Tides, Storm runoff, On-site data collections, Sampling, Simulation analysis.
Identifiers: *Jamaica Bay(NY), *New York City(NY).

This report described a hindcast of post-rainstorm coliform bacteria distributions in Jamaica Bay made by use of a water-quality simulation model of that bay and models of the surrounding drainage basins on the basis of tide, wind, and rainfall data. That hindcast was then compared with coliform estimates obtained by field sampling. Although the investigators did not have access to the results of the field sampling until the hindcast was completed, the estimates obtained by simulation agreed well with the estimates from field data. It was concluded that the models used were capable of making predictions for engineering assessments. (See W75-07042; W73-07935; W72-06980; W72-06979; and W71-04038) (Sims-ISWS)
W76-08317

UPDATING THE NAVY ENVIRONMENTAL PROTECTION DATA BASE TO INCORPORATE OIL SPILL CLEAN-UP PERFORMANCE,
Naval Postgraduate School, Monterey, Calif.
J. Antonelli.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A012 663, $4.25 in paper copy, $2.25 in microfiche. Master's thesis, june 1975. 70 p, 11 fig, 9 ref, 5 append.

Descriptors: *Oil spills, *Oil pollution, *Water pollution, *Information retrieval, Computers, Data transmission, Ships, Water pollution sources, Water pollution control, Military aspects, Harbors, Estuaries.
Identifiers: *Reporting systems, *Data bases, Computer data bases, Oil-spill clean-up.

In this thesis, proposals were formulated on methods of reporting, collecting, and disseminating information on the surrounding conditions of an oil spill to and from the Navy Environmental Protection Data Base. The reporting aspect consists of a contingency plan and two reports, an initial report and an after action report. Such a reporting method is possible because of a proposed retrieval system. The data collection method emphasizes information that will produce an accurate cost figure. The dissemination process consists of new report formats to be included in the quarterly summary reports. (Sims-ISWS)
W76-08320

CORALVILLE WATER QUALITY STUDY, ANNUAL REPORT, WATER YEAR OCTOBER 1, 1974 TO SEPTEMBER 30, 1975,
Iowa University, Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5A.
W76-08324

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY, PART II: NON-CONSERVATIVE SPECIES TRANSPORT MODELS,
Alabama Univ., Dept. of Chemical and Metallurgical Engineering.
H-A. Liu, and G. C. April.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-17772, $7.75 in paper copy, $2.25 in microfiche. BER Report No. 185-112, Master's thesis, January 1975. 188 p, 40 fig, 15 tab, 32 ref, 2 append. NASA NAS8-29100.

Descriptors: *Model studies, *Rivers, *Bays, *Water quality, *Alabama, Mathematical models, Computer models, Computer programs, Coliforms, Temperature, Water transfer, Flow rates, Streamflow, Path of pollutants, Water pollution, Estuaries.
Identifiers: *Mobile Bay(Ala).

The purpose of this research effort was to expand the mathematical modeling capabilities of the hydrodynamic and salinity models of Hill and April to include a description of non-conservative species transport in the Mobile Bay system. The knowledge gained provided a clear insight into the effect that rivers draining into the bay have on water quality conditions. Total coliform group bacteria were selected because of their relationship to commercial fishing ventures within bay waters and also on the basis of data availability sufficient for model calibration and verification. Results were presented as monthly average distributions corresponding to the data base used. A parametric study was also conducted. In this study, river flow rates, wind conditions, and bay system temperatures were investigated to determine their influence on the total coliform concentration patterns. Of these factors, temperature and river flow rate had a pronounced effect on the concentration profiles, while wind conditions showed only slight effects. Shifts in concentration profiles as much as 8 km were observed in extreme cases. The effect of changing total coliform group loading concentrations at constant river flow rates and temperature was also investigated. As expected, these loading changes had an appreciable influence on total coliform distribution within Mobile Bay. (Sims-ISWS)
W76-08327

POLLUTANT TRANSPORT IN NATURAL STREAMS,
Du Pont de Nemours (E. I.). and Co., Aiken, S.C. Savannah River Lab.
M. R. Buckner, and D. W. Hayes.
Report DP-MS-74-53, 1975. 15 p, 5 fig, 10 ref. ERDA AT(07-2)-1.

Descriptors: *Model studies, *Path of pollutants, *Streams, Radioisotopes, Chemicals, Tritium, Mathematical models, Rivers, Tributaries, Dispersion, Industrial wastes, Pollutants, Water pollution, Sampling, Tracers, Dye releases, Sediments, Deposition(Sediments), Ion exchange, *Georgia.
Identifiers: *Savannah River(Ga).

A mathematical model has been developed to estimate the downstream effect of pollutant releases to tributary streams and rivers. The one-dimensional dispersion model was employed along with a dead zone model to describe stream transport behavior. Options were provided for sorption/desorption, ion exchange, and particle deposition in the river. The model equations were solved numerically by the LODIPS computer code. The solution method was verified by application to actual and simulated releases of radionuclides and other chemical pollutants. (Sims-ISWS)
W76-08329

SOLUTION FOR RADIAL-FLOW WITH NON-LINEAR ADSORPTION,
Amoco Production Co., Tulsa, Okla.
S. P. Gupta, and R. A. Greenkorn.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102 No. EE1, Proceedings Paper 11901, p 87-94, February 1976. 2 fig, 14 ref, 2 append.

Descriptors: *Groundwater movement, *Path of pollutants, *Adsorption, *Dispersion, *Porous media, *Soil contamination, *Computer models, Flow, Groundwater, Base flow, Movement, Water pollution, Water pollution sources, Waste disposal, Environmental engineering, Diffusion, Convection, Hydrology, Numerical analysis.
Identifiers: *Radial flow, Nonlinear adsorption, Point-source radial flow, Crank-Nicolson method, Freundlich isotherm, Finite difference approximation.

A nonlinear convective diffusion equation was obtained for a radial flow with Freundlich equilibrium adsorption. Numerical solution by explicit or implicit finite difference approximation requires large computation time and suffers from the error due to 'numerical dispersion.' The equation was solved by an efficient and higher order finite difference approximations, i.e., the Crank-Nicolson method. The numerical solution is useful for studying the spatial and temporal movement of the chemicals from contaminated water. (Bender - ISWS)
W76-08345

DETERMINATION OF BIOLOGICAL DEGRADABILITY OF ORGANIC SUBSTANCES,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
P. Pitter.

Water Research, Vol. 10, No. 3, p. 23-235, 1976. 1 fig., 3 tab., 11 ref.

Descriptors: *Biodegradation, *Organic compounds, Chemical oxygen demand, Carbon, Activated sludge, Microbial degradation, Aromatic compounds.
Identifiers: Aliphatic compounds, Hydroaromatic compounds.

Experiments on the degree and rate of biological degradation of 123 organic compounds with respect to decrease of the organic substance in terms of chemical oxygen demand were conducted. The organic substances were the sole source of carbon for microbes in the inoculum which was adapted activated sludge from a sewage plant. The degradation rate was expressed in terms of mg of chemical oxygen demand removed by a gram of the initial dry matter in the inoculum per hour. Degradation rates were determined for 94 aromatic, 15 hydroaromatic, and 14 aliphatic compounds. Pyrogallol, metol, 3,4-dimethylaniline, N-phenylanthranilic acid, 2-chloro-4-nitrophenol, 2,4,6-trinitrophenol, 3,5-dinitrobenzoic acid, 3,5-dinitrosalicylic acid, nitroanilines, 0-phenylenediamine, m-phenylenediamine, aminophenolsulphonic acid, 1-naphthylamine, 1-naphthylamine-6sulphonic acid, m-benzenedisulphonic acid, 2,5-dinitrophenol, 2,6-dinitrophenol, 1,3-dinitrobenzene, and 1,4-dinitrobenzene were resistant to biological decomposition. Factors affecting biological degradability are identified as: physicochemical factors (temperature, solubility, degree of dispersion of compound in media, pH, dissolved oxygen), biological factors (history of microbial culture; its age, manner, and time of adaptation; compound toxicity; effect of other substrates), and chemical factors (molecular size; length of chain; kind, number, and position of substituents in the molecule stereochemistry). (Buchanan-Davidson--Wisconsin).
W76-08351

A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS,
Agricultural Research Service, Watkinsonville, Ga.
R. R. Bruce, L. A. Harper, R. A. Leonard, W. M. Snyder, and A. W. Thomas.
Journal of Environmental Quality, Vol. 4, No. 4, p. 541-548, 1975. 8 fig., 1 tab., 18 ref.

Descriptors: *Mathematical models, *Agricultural runoff, *Pesticides, *Watersheds(Basins), *Georgia, Translocation, Erosion, Storms, Rainfall-runoff relationships, Rainfall intensity, Rill erosion, Model studies, *Path of pollutants.
Identifiers: Watkinsville(Ga).

A mathematical model describing runoff rates and quantities from separate rainfalls on a watershed and the rates and quantities of sediments and pesticides transported was developed. Runoff water was calculated and rill and interrill erosion conceptually distinguished, permitting partitioning of associated pesticides. Sediment contributions from interrill erosion were a function of rainfall intensity and soil susceptibility to erosion. Rill erosion was a function of water runoff and rate of change of water runoff. Runoff pesticide concentrations were functions of runoff amounts, sediment from rill and interrill erosion, and pesticide concentrations in runoff-erosion zones. Excellent simulations were obtained when the model was used to simulate water, sediment, and pesticide runoff from an upland Piedmont plain watershed during summer storms. Pesticide runoff simulations were achieved using simple relationships between relatively immobile soil pesticide concentrations and eroded sediments. Other versions of this model are being considered to simulate mobile chemical runoffs which will include subsurface water transport. The chemical component will be revised to accommodate major chemical extractions from soil without soil movement and show subsurface flow characteristics. Updating of water and chemical conditions between storms is necessary but depends on the watershed cultural system and chemicals used. (Buchanan-Davidson--Wisconsin)
W76-08356

BEHAVIOUR OF OIL UNDER CANADIAN CLIMATIC CONDITIONS. PART 1. OIL ON WATER UNDER ICE-FORMING CONDITIONS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Quality Branch.
B. F. Scott, and R. M. Chatteriee.
Scientific Series No. 50, 1975. 28 p, 15 fig, 8 tab, 16 ref.

Descriptors: *Weathering, *Oil spills, *Cold regions, *Freezing, *Canada, Aquatic life, Weather data, Analysis, Snow, Water pollution effects, Ice cover, Oil pollution.
Identifiers: Ottawa(Canada).

Experiments conducted at Shirley's Bay Quiet Site near Ottawa, to determine the effect of freezing temperatures on the behavior of oil, are described. For the first 24 hours after the spill, freeze-up conditions prevailed with wind speed and clear skies; the oil lost approximately 29% by weight of its components during the first day, including the volatile fractions, some of which had evaporated within an hour after the spill. Once the volatile fraction was removed, loss of the other oil components took longer and depended on the climate. A sample taken three days after above-freezing temperatures contained no actane; 40% by volume of the oil had evaporated--a loss of another 10%. During 4C temperatures and cloudy skies for the following three days, 46% by volume of the oil had evaporated, characterized by the loss of nonane. Decane was present in samples eight days after the spill, when about 50% of the oil remained. Accelerated wind speed and moderate air temperatures augmented evaporation while low temperatures retarded the evaporation rate. Very little surface oil was evident in the pond during spring clean-up but an oily slime was noted on the bottom of the pool. Oil inhibited small forms of aquatic life but increased the abundance of others. (Auen-Wisconsin)
W76-08365

THE KINETICS OF MICROBIAL NITRIFICATION,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-08369

MINE DRAINAGE POLLUTION WATERSHED SURVEY, CHERRY CREEK, CASSELMAN RIVER WATERSHEDS, GARRETT COUNTY, MARYLAND.
Skelly and Loy, Harrisburg, Pa.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 610 $11.00 in paper copy, $2.25 in microfiche. Prepared for the Appalachian Regional Commission, Washington, D.C., May 1973. Final Report. 417 p, 33 fig, 42 ref, 8 append. ARC No. 42-47/RP-228.

Descriptors: *Water pollution, Abatement, *Water pollution control, *Pollution abatement, *Water quality, *Acidic water, *Acid mine water, *Mine acids, *Coal mine wastes, Data collection, Aquatic animals, Environment, Regional analysis, Maryland, Pennsylvania, *Watershed management, Landfill.
Identifiers: Cherry Creek(MD), Casselman Creek(PA and MD).

This study area includes the 14 square mile Cherry Creek Watershed and a 70 sq mi portion of the Casselman River Watershed, in MD and PA. There has been coal mining in this area for over 100 years which benefited the local economy but caused water pollution. This study was carried out in 8 phases: collect and review data; reconaissance; control sampling in some streams; detailed field explorations; subsurface explorations; interpret aquatic biotic data; mine development drawing; and evaluate sources and abatement measures. Essential was the sampling program which measured discharge from mines and the effect of mine drainage on the receiving streams. Water quality, flow and weather data were collected 14 times during the year at 82 sampling stations. As background data, the quality of unpolluted streams was also measured. Of the four major streams studied, Cherry Creek is the most seriously polluted, but only 1/4 of this can be laid to acid load derived from mines. The rest is natural. The North Branch Casselman River is the second worst polluted and is moderately affected by mine drainage over many stream miles. The South Branch Casselman River and the Casselman River are slightly polluted from mine drainage. The water quality in these streams has been degraded sufficiently to suppress many kinds of acquatic life including normally occuring game fish. An abatement program is suggested. The estimated 2400 lbs/day of acid being discharged at the site of 38 recommended abatement projects could be curtailed at a cost of $1,359,000. Projects include recontouring of mine sites, plugging of mines, burial of solid waste, and use of sites as sanitary landfill. (Smith-North Carolina)
W76-08386

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
D. McLaughlin, J. A. Elder, G. T. Orlob, D. F. Kibler, and D. E. Evenson.
NOAA Report TM ERL MESA-4; December 1975. 373 p, 68 fig, 33 tab.

Descriptors: *Ecosystems, *Water pollution sources, *Pollutants, *Environmental Engineers, *Marine geology, *Marine biology, Water quality, Model study, Environmental control, New York.
Identifiers: Bight, New York Bight, *New York Bight ecosystems.

This technical memorandum offer a comprehensive, conceptual representation of the physical, geological, chemical and biological process that affect the New York Bight ecosystem, as well a some specific recommendations suggesting where field and laboratory research efforts should be undertaken to support a satisfactory evaluation of management alternatives in the New York Bight. The report identifies the important problems in the New York Bight, in order to develop effective strategies and research efforts towards solving them. They are; the movement of undesirable materials onto beaches, shellfish contamination, and a decline and instability in migratory fisheries. The problem is described, the critical subsystems are identified, they are reviewed in the light of present knowledge, and a set of recommendation (or research tasks) for future implementation is proposed. (NOAA)
W76-08411

CHLORINATED HYDROCARBONS IN MESOPELAGIC FISHES OF THE EASTERN GULF OF MEXICO,
University of South Florida, St. Petersburg, Fla.
For primary bibliographic entry see Field 5C.
W76-08434

DDT AND ITS METABOLITES IN THE SEDIMENTS OFF SOUTHERN CALIFORNIA,
National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-08436

NOTE ON THE DISTRIBUTION OF MERCURY IN FISH SPECIES IN THREE OHIO LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5C.
W76-08441

PASSAGE OF METALS IN EFFLUENTS, THROUGH BACTERIA TO HIGHER ORGANISMS,
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.
F. M. Patrick, and M. Loutit.
Water Research, Vol. 10, p 333-335, 1976. 1 fig, 3 tab, 7 ref.

Descriptors: *Heavy metals, Benthos, *Absorption, *Tubificids, *Path of pollutants, *Primary productivity, *Aquatic bacteria, Chromium, Copper, Manganese, Lead, Iron, Zinc, *Food chains, *Food webs, Bacteria, Aquatic animals, Benthic fauna, Analytical techniques, Laboratory tests, Bioassay, Effluents, Water pollution effects.
Identifiers: *Bioaccumulation.

Bacteria from river bottom sediments were cultured in the laboratory on culture plates containing six metals in the medium. Bacteria were found to concentrate the metals and tubificids fed bacterial cultures containing these metals showed increased amounts of the metals. It is thought that small amounts of metals in effluents are concentrated by bacteria and are then passed to other organisms in a food chain. (Katz)
W76-08449

STAFFLINERS PREVENT CONTAMINANTS FROM POLLUTING GROUND WATER AT INDUSTRIAL WASTE TREATMENT CENTER.
For primary bibliographic entry see Field 5D.
W76-08466

THERMAL-HYDRAULIC MODEL STUDY OF OFFSHORE DISCHARGE SYSTEM FOR KAHE POWER PLANT, HAWAII,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
S. C. Jain, M. Leonard, and J. F. Kennedy.
IIHR Report No. 184, January 1976. 33 p, 18 fig, 1 tab, 6 ref.

Descriptors: *Model studies, *Hydraulic models, *Heated water, *Hawaii, Powerplants, Outlet works, Outlets, *Thermal pollution, Path of pollutants, Oceans, Coasts, Water cooling, Temperature, Water temperature, Heat, Dispersion, Ocean currents, Currents(Water).
Identifiers: Kona currents.

The investigation was concerned with the design of the outfall structure for the condenser cooling-water discharge from Kahe Power Plant. The recommended discharge structure consists of two 12-ft diameter pipes, each terminating into an 11-ft diameter nozzle discharging offshore at an angle of 20 degrees above horizontal. The nozzles will be located at a water depth of 27 ft below MLLW. The model tests indicated that the recommended outfall configuration will satisfy both average and instantaneous criteria on temperature rise for longshore currents and for small Kona currents. Only under some larger Kona currents does the maximum instantaneous temperature at the bottom exceed 3 degrees F and the maximum average temperature near the shoreline close to the baffles (installed to produce Kona currents) exceed 1.5 degrees F and then only by small amounts. (Sims-ISWS)
W76-08508

RADIAL DISPERSION THROUGH ADSORBING POROUS MEDIA,
Sargent and Lundy, Chicago, Ill.
A. Prakash.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11995, p 379-396, March 1976. 7 fig, 2 tab, 23 ref, 2 append.

Descriptors: *Adsorption, *Dispersion, *Porous media, *Mathematical models, Finite element analysis, Hydraulics, *Tracers, Ion transport, Convection, Diffusion, Equilibrium, Groundwater, Velocity, Equations, Wells, Water pollution, *Path of pollutants.
Identifiers: *Radioactive decay, *Transport mechanisms, Galerkin technique, Miscible displacement, Tortuosity, Nonequilibrium conditions, Partial penetration.

The convective-dispersion equation for the transport of a radioactive tracer through an adsorbing porous medium was solved in the cylindrical polar system of coordinates by the Galerkin finite element method. The effect of radioactive decay and equilibrium or nonequilibrium adsorption isotherms on the radial movement of pollutants containing different radioactive isotopes was illustrated. The solution technique was extended to special cases of anisotropic porous media. It was concluded that radioactive decay is an important mechanism for the transport of relatively short-lived radionuclides. The contribution of adsorption in retarding the propagation of concentration depends on the clay content of the porous medium and the chemical properties of the ions being transported. (Visocky-ISWS)
W76-08512

THE ROLE OF ORGANIC DETRITUS IN THE FORMATION OF DISTINCTIVE SANDY TIDAL FLAT SEDIMENTARY STRUCTURES, TAY ESTUARY, SCOTLAND,
Dundee Univ., Newport-on-Tay (Scotland). Tay Estuary Research Center.
For primary bibliographic entry see Field 2L.
W76-08524

MERCURY IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
R. L. Thomas, and J-M. Jaquet.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 404-412, March 1976. 6 fig, 3 tab, 31 ref.

Descriptors: *Lake sediments, *Mercury, *Sediments, *Lake Erie, *Distribution patterns, Water pollution, *Great Lakes, Analytical techniques, Toxicity, Water pollution sources, Surface waters, Sedimentation, Inorganic compounds, Sediment distribution, Chemicals, Public health, Industrial wastes, Pollutant identification, On-site investigations, Sampling, Path of pollutants, Suspended load, Carbon, Bacteria, Benthos, Bottom sediments.
Identifiers: Surficial sediments, Detroit River, *Methylmercury, Organic carbon, Mercury poisoning, Chlor-alkali plants.

In 259 samples of the topmost 3 cm of sediment taken from Lake Erie in 1971, total mercury values ranged from 8 to 2929 ppb (with a mean of 582 + or - 555 ppb sd). The highest levels were in the Western basin adjacent to the Detroit River, the rest of the lake showing increasing concentration from the coarser sediments of the Inshore Zone and cross-lake moraine sills out into the basin muds. A quartz correction was applied to compensate for texture and dilution by an inert constituent. The distribution of quartz-corrected mercury confirmed that the Detroit River is the predominant source of industrial mercury to the Western basin with subsequent transport across the Central basin to final sink in the Eastern basin. Further possible inputs were indicated from Erie, Pennsylvania, and Buffalo, New York. Analysis of suspended sediment in the Detroit River showed no change in concentration between 1970 and 1974 with a mean 1974 level of 1060 ppb. Mercury loading was estimated at 7.2 m.t./yr to the sediments of the Western basin. A relationship was observed between total mercury and organic carbon, showing two distinct regressions: 'A' with lower organic-bound mercury, is taken to represent the levels related to industrial and natural loadings existing prior to the introduction of mercury cell chlor-alkali plants; 'B' applicable to highly contaminated sediments, is believed to be indicative of loadings derived from the chlor-alkali industry. (Henley - ISWS)
W76-08526

FORMS OF PHOSPHORUS IN THE SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
J. D. H. Williams, J-M. Jaquet, and R. L. Thomas.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 413-429, March 1976. 8 fig, 4 tab, 36 ref.

Descriptors: *Lake sediments, *Phosphorus, *Lake Erie, *Phosphates, *Phosphorus compounds, *Distribution patterns, *Great Lakes, *Sediments, Inorganic compounds, Analytical techniques, Chemicals, Water pollution sources, Surface waters, Sediment transport, Geology, Sedimentation, Sediment sorting, Chemical properties, Lake basins, Detritus.
Identifiers: Organic phosphorus, Inorganic phosphorus, *Surficial sediments, Apatite, Vivianite, Organic carbon, Detrital origin, Phyllosilicate minerals.

The phosphorus in 48 surficial Lake Erie sediment samples was present in three major forms: phosphorus associated with apatite, nonapatite inorganic phosphorus (NAIP), and organic phosphorus. The apatite was of natural, detrital origin. It existed as particles ranging from fine sand to clay in size but mostly as siltsized particles and was concentrated in nearshore sediments. Both NAIP and organic phosphorus was concentrated in fine-grained sediments accumulating in offshore depositional areas. NAIP was associated with amorphous hydrated ferric oxide in the oxidized microzone but was present as vivianite (Fe3(P04)2.8H20) and possibly other forms also in the reduced zone. The organic phosphorus content of the sediment was closely related to organic carbon content. The phyllosilicate, organic matter, and reactive iron and manganese components of the sediments existed in intimate association. (Henley-ISWS)
W76-08527

FORMS OF IRON AND MANGANESE IN LAKE ERIE WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns, and J. O. Nriagu.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 463-470, March 1976. 5 fig, 1 tab, 22 ref.

Descriptors: *Iron, *Manganese, *Lake Erie, *Water chemistry, *Great Lakes, *Iron compounds, Analytical techniques, Iron oxides, Inorganic compounds, Surface waters, *Lake sediments, Mud-water interfaces, Silts, Water quality, Chemical analysis, Bottom sediments.
Identifiers: *Sediment resuspension, Sediment-water interface, Aquatic ecosystems, Particulate iron, Resuspended clays, Anoxic conditions, Soluble manganese, Manganese oxides.

About 95% of the iron observed in the lake water is bound to inorganic particles and is present in the water because of sediment resuspension. Contrary to popular belief, the upwelling of interstitial waters charged with ferrous iron does not appear to play an important part in the regeneration of iron from Lake Erie sediments except when anoxic conditions exist at the sediment-water interface.

By contrast, manganese is usually found in the overlying water as a result of the release of interstitial water containing dissolved manganese. This precipitates in oxygenated water so that most of the manganese present in the water is found in the particulate form. However, the released manganese will remain soluble if the oxygen saturation is less than 50%. In general, it was found that both the iron and manganese were in the particulate or soluble form in accordance with the geochemical solubility rules. (Henley - ISWS)
W76-08528

SEDIMENT YIELDS AND NUTRIENT LOADINGS FROM CANADIAN WATERSHEDS TRIBUTARY TO LAKE ERIE: AN OVERVIEW,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
E. D. Ongley.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 471-484, March 1976. 7 fig, 4 tab, 23 ref.

Descriptors: *Sediments, *Lake Erie, *Canada, *Rivers, Sampling, Monitoring, Suspended solids, Phosphorus, Nitrogen, Chlorides, Runoff, Watersheds(Basins), Discharge(Water), Nutrients, Pollutants, Water quality, Sediment discharge, Sediment transport, *Lake sediments, Sedimentation.

Mean annual loadings and unit yields for sediment, phosphorus, nitrogen, and chloride have been calculated for 19 river-mouth locations on the Canadian side of Lake Erie for the period 1967-72. Data, drawn from routine monitoring data files of Federal and Provincial agencies, were discussed in terms of biases inherent in such monitoring programs. Unit yields are only marginally related to basin substrate texture but show pronounced storage characteristics within basins for sediment and sediment-bound nutrients. It was suggested that there is a minimum threshold size of basin below which nutrient runoff is relatively unaffected by basin storage and uptake. (Sims - ISWS)
W76-08529

NUMERICAL COMPUTATIONS OF ADVECTIVE AND DIFFUSIVE TRANSPORTS OF CHLORIDE IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
D. C. L. Lam, and T. J. Simons.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 537-549, March 1976. 7 fig, 18 ref.

Descriptors: *Chlorides, *Mathematical models, *Lake Erie, *Water circulation, *Model studies, Great Lakes, *Path of pollutants, Inorganic compounds, Lakes, Surface waters, Analytical techniques, Testing, Mathematics, Circulation, Advection, Diffusion, Dispersion, Movement, Numerical analysis, Hydrodynamics.
Identifiers: *Chloride transports, Transport mechanisms, Advective transport, Diffusive transport, Aquatic systems.

This paper concerns a numerical simulation of lakewide advective and diffusive transports of conservative pollutants or nutrients, such as chloride, in Lake Erie. The study was a continuation of a hydrodynamic modeling experiment to compute water circulations throughout the 1970 shipping season and made use of ship observations of chloride distributions at approximately 4-wk intervals during 1970, together with estimates of river loadings for the same periods. The model equations were based on the time-dependent, mass-conserving advection-diffusion equation. A vertically mixed, one-layer, two-dimensional model was employed for spring and fall, whereas a two-layer model was used to simulate the stratified lake in summer. The equations were solved by finite-difference formulations on a horizontal grid with a mesh size of 6.67 km. Using time steps of 6 h, predictions were made of the change of chloride concentrations between pairs of cruises and the results were compared with observation. While the advective currents were derived from the previous hydrodynamic study, diffusion coefficients were estimated by comparing model results for a range of coefficients. The resulting numerical values compared favorably with findings of diffusion experiments in actual lake environments. (Henley - ISWS)
W76-08530

COMPUTATIONS OF PHYSICAL TRANSPORT AND REGENERATION OF PHOSPHORUS IN LAKE ERIE, FALL 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
D. C. L. Lam, and J-M. Jaquet.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 550-563, March 1976. 7 fig, 5 tab, 32 ref.

Descriptors: *Lake Erie, *Phosphorus, *Model studies, Mathematical models, Computer models, Sediment transport, Phosphorus compounds, Waves(Water), Winds, Suspended solids, Sediments, *Path of pollutants, Nutrients, Pollutants, Sedimentation.
Identifiers: *Phosphorus regeneration.

A one-layer, two-dimensional computer model for the time-dependent, lake-wide advective and diffusive transports as well as physical regeneration of total phosphorus in Lake Erie has been developed. It has 60 x 16 square grid cells of 6.67-km mesh size and uses a time step of 12 h. The model has been verified and found to be in reasonably good agreement with the Canada Centre for Inland Waters (CCIW) monitor cruise data for October, November, and December, during which period there were high winds with high phosphorus concentrations being observed. Computed daily averaged currents from a hydrodynamic model developed at CCIW were used for the transport terms and actual data for the lake boundary conditions. The physical regeneration was attributed to wave motions induced by wind. A formula was proposed which expresses the regenerated amount of total phosphorus in terms of wave orbital velocity and sediment mean grain size. A discussion was presented on the choice of the settling rate and the regeneration coefficient which produce satisfactory model results. (Sims-ISWS)
W76-08531

RATE OF CHLORIDE AND WATER MOVEMENT IN SOUTHERN CALIFORNIA SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W76-08545

NITRATE REDUCTION AND ASSOCIATED MICROBIAL POPULATIONS IN A PONDED HANFORD SANDY LOAM,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5G.
W76-08546

TRANSFER OF BORON AND TRITIATED WATER THROUGH SANDSTONE,
New Mexico State Univ., University Park. Dept. of Agronomy.
P. J. Wierenga, M. T. van Genuchten, and F. W. Boyle.
Journal of Environmental Quality, Vol. 4, No. 1, p 83-87, January-March 1975. 4 fig, 1 tab, 25 ref.

Descriptors: *Sandstones, *Boron, *Dispersion, *Groundwater movement, *Water quality, Groundwater recharge, Groundwater basins, New Mexico.
Identifiers: Tritiated water.

The movement of tritiated water and boron were determined during unsaturated flow through undisturbed sandstone cores. From the displacement and slope of the breakthrough curves relative to 1 pore volume of effluent, adsorption coefficients and dispersion coefficients were calculated of 0.135 and 1.06 cm(2)/day for boron, and 0.04 and 3.45 cm(2)/day for tritiated water, respectively. The data were used to predict the downward movement of boron through a sandstone formation in the Four Corners area of New Mexico. With 20 cm annual rainfall and 10% of the precipitation contributing to recharge, it was calculated to take 1,628 years for the boron concentration at the ground-water table at 86 m to reach one-half the boron concentration at the soil surface. (Skogerboe-Colorado State)
W76-08547

DISTRIBUTION AND MOVEMENT OF ZINC AND OTHER HEAVY METALS IN SOUTH SAN FRANCISCO BAY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
W. L. Bradford.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-251 111/A's, $4.50 in paper copy, $2.25 in microfiche. Water-Resources Investigations 37-75, February 1976. 58 p, 7 fig, 11 tab, 36 ref.

Descriptors: *Water pollution sources, *Bays, *Heavy metals, *Bottom sediments, *Path of pollutants, Chemical analysis, Suspended solids, Water analysis, Sediments, Zinc, Iron, Manganese, Copper, Cobalt, Nickel, Lead, Cadmium, Sampling, Data collections, Analytical techniques, *California.
Identifiers: *San Francisco Bay(Calif).

From September to December 1972, zinc in aqueous solution was discharged into south San Francisco Bay, Calif., from eight wastewater treatment plants at a net rate of 77 kilograms per day. This newly added zinc moved from the aqueous phase to the bottom sediment at a rate of about 0.026 micrograms/sq centimetre/day. The concentrations of extractable Fe, Mn, and Zn in the suspended solids of bay water increased significantly with time but the total mass of zinc in the study area residing in the suspended solids remained constant. Bottom sediments were aanalyzed for Fe, Mn, Zn, Cu, Co, Ni, and Pb in the 2 mm-20 micron and less than 20 micron size fractions. Concentrations of all but Ni were higher in the smaller size fraction by factors of 2 to 5. A varimax factor analysis of these data indicated that the concentration of each metal in the sediment is controlled by a separate process. Most of the variance in the lead concentrations in both size fractions is apparently due to the same factor, suggesting a single major source of lead such as automobile emissions. In water samples after 5 days' settling, Zn and Cu were being sequestered by fast reacting chelators, a fraction of which would not pass a 0.22 millimicron filter. Zn and Cd were being sequestered by slow reacting chelators. The mean increase in concentration caused by destroying these latter chelators was 0.66 micrograms/litre of Zn and 0.023 micrograms/litre of Cd. (Woodard-USGS)
W76-08561

SAVANNAH RIVER LABORATORY ENVIRONMENTAL TRANSPORT AND EFFECTS RESEARCH ANNUAL REPORT - 1974.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
Available from the National Technical Information Service, Springfield, Va 22161, as DP-1374, $7.50 in paper copy, $2.25 in microfiche. June 1975. 206 p, 86 fig, 29 tab, 78 ref. Compiler, Crawford, T. V. ERDA AT (07-2)-1.

Descriptors: *Environmental effects, Pollutants, *Water pollution, Path of pollutants, Radioactivity, Thermal stress, Groundwater, Surface waters, Model Studies, *Thermal pollution.

A principal objective of environmental transport research at SRL was to develop, apply, adapt, use, test, and verify models that predict the directions and magnitude of ecosystem processes. A series of articles, within a wide variety of disciplines is presented, describing the transport and dispersion of pollutants through the atmosphere of the southeastern United States, transport and dispersion of pollutants in the surface and ground water systems near the SRP, movement of radioactivity in soil and plant systems, the effect of C 14 production by the nuclear industry, thermal stress on aquatic organisms, and the effects of earthquakes upon ground displacement velocity and acceleration in the southeastern United States. A total of 26 papers are presented; 3 of these are concerned with pollutants in water and 7 with thermal stress on aquatic organisms. (Chilton-ORNL)
W76-08596

TRANSURANIUM NUCLIDES IN THE ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-08597

PLUTONIUM IN THE AQUATIC ENVIRONMENT, ITS BEHAVIOUR, DISTRIBUTION AND SIGNIFICANCE,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5C.
W76-08599

THE PLUTONIUM CONTENT OF PACIFIC OCEAN WATERS,
Geochemistry Research Association, Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W76-08601

DISTRIBUTIONS OF TRANSURANIUM NUCLIDES IN SEDIMENT AND BIOTA OF THE NORTH ATLANTIC OCEAN,
Woods Hole Oceanographic Institution, Mass.
V. T. Bowen, H. D. Livingston, and J. C. Burke.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 107-120, 3 tab, 2 fig, 21 ref. E(11-1)-3563.00, E(11-1)-3563.01, E(11-1)-2379.

Descriptors: *Distribution patterns, *Radioisotopes, *Sediments, *Biota, Aquatic life, Plutonium, Americium, Atlantic Ocean, Benthos.

The report discusses the initial penetration of radionuclides into sediments, the redistribution of radionuclides within sediment columns and their release to the water column, and the availability of sediment transuranics to biota. In some types of sedimentation regimes transuranic radionuclides may be expected to remain immobile after deposition. In most types translocation of deposited plutonium and americium back toward the sediment surface takes place. The evidence also suggests some return of these radionuclides back to the water column. The activities of the benthic biota, and especially of the larger, burrowing worms aid in these transuranic remobilizations. (See also W76-08597) (Chilton-ORNL)
W76-08602

COMPARISON OF THE DISTRIBUTIONS IN MARINE SEDIMENTS OF THE FALLOUT DERIVED NUCLIDES FE 55 AND PU 239,240, A NEW APPROACH TO THE CHEMISTRY OF ENVIRONMENTAL RADIONUCLIDES,
Woods Hole Oceanographic Institution, Mass.
L. D. Labeyrie, H. D. Livingston, and V. T. Bowen.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 121-137, 3 fig, 4 tab, 31 ref.

Descriptors: *Distribution patterns, *Radioisotopes, Sediments, Marine geology, Geochemistry, Atlantic Ocean, Sea water.

Evaluation of the data suggests different hypotheses on the iron geochemical cycle and the consequences in trace element transport. In shallow water sediments, bacterial activity would solubilize available iron which would precipitate as microparticulates at the seawater-sediment interface carrying down with it trace elements. Dispersed microparticulates would translocate towards the open sea. Fe 55 exhibits a mean sinking rate of 350 m/a while the particle settling speed of plutonium is significantly smaller. The data is consistent with the hypothesis of two populations of particles of different sinking characteristics and the possibility of a good deal of overlap between the two populations. The authors conclude that Fe 55 and Pu 239, 240 should be considered as among the best tracers at present available for the study of the contamination problems on the continental shelf and open ocean particulate-seawater interactions. (See also W76-08597) (Chilton-ORNL)
W76-08603

INTERACTION OF PLUTONIUM WITH COMPLEXING SUBSTANCES IN SOILS AND NATURAL WATERS,
Oak Ridge National Lab., Tenn.
E. A. Bondietti, S. A. Reynolds, and M. H. Shanks.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 273-287, 1 fig, 5 tab, 23 ref.

Descriptors: *Environmental effects, *Plutonium, *Chemical reactions, Soils, Analytical techniques.

The valence and metalcomplex behaviour of Pu with selected organic substances in the environment were investigated. Hexavalent Pu was unstable in the presence of fulvic acid, polygalacturonic acid, and alginic acid. Citrate-Pu(VI) complexes were more stable and Pu(IV) was the most stable valence in interaction with these compounds. A more feasible oxidation state change appears to be reduction to Pu(III), however, the acidity of the reducing environment is critical and Pu(IV) reduction does not appear to occur above pH 6.0 at normally encountered redox conditions of anaerobic systems. The soil-resin transfer studies indicated that after 30 years, a substantial fraction of the Pu in the contaminated soil does not readily desorb under conditions favoring exhaustive removal. Considering the very strong Pu interaction with the solid phase soil it appears that leaching losses of Pu will be insignificant compared to physical movement of contaminated particles. (See also W76-08597) (Chilton-ORNL)
W76-08605

PLUTONIUM AND AMERICIUM IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W76-08606

PLUTONIUM RADIONUCLIDES IN THE GROUNDWATERS AT ENEWETAK ATOLL,
California Univ., Livermore. Lawrence Livermore Lab.
V. E. Noshkim, K. M. Wong, K. Marsh, R. Eagle, and G. Holladay.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 517-543, 7 fig, 12 tab, 18 ref. W-7405-ENG-48.

Descriptors: *Environmental effects, *Radioisotopes, *Plutonium, *Groundwater, Atells, Cesium, Freshwater, Reservoirs.

Chemical and radiochemical data is provided for the assessment of water quality on selected islands of the Enewetak Atoll which have been designated for rehabilitation. Data shows that small quantities of plutonium radionuclides have migrated through the soil and are redistributed throughout the groundwater reservoirs. The maximum surface concentrations found were less than 0.02% of the maximum recommended concentration for drinking water. Cs 137 concentrations were found to correlate with water freshness. Mechanisms which move Pu 239, 240 through the groundwater reservoirs were found to be independent of the processes controlling the cycling of Cs 137 and fresh water. A linear correlation was found between mean surface-water concentrations and soil burdens. Quantities of Pu 239, 240 migrating to the groundwater did not correlate with any known differences in the physical, chemical or biological characteristics of the area. (See also W76-08597) (Chilton-ORNL)
W76-08607

THE RESPONSES OF SOILS AND SOIL MICROORGANISMS TO SILVER IODIDE WEATHER MODIFICATION AGENTS,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 2G.
W76-08670

CALCULATED DRAINAGE WATER COMPOSITIONS AND SALT BURDENS RESULTING FROM IRRIGATION WITH RIVER WATERS IN THE WESTERN UNITED STATES,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. D. Oster, and J. D. Rhoades.
Journal of Environmental Quality, Vol. 4, No. 1, p 73-79, January-March 1975. 4 fig, 3 tab, 25 ref.

Descriptors: *Model studies, *Simulation analysis, Lysimeters, Alfalfa, Leaching, Return flow, Salinity, Saline water, Irrigation water, *Drainage water, Salts, Rivers.

Drainage water compositions were calculated with a computer simulation model from irrigation water compositions, leaching fractions, aragonite and gypsum solubilities, and measured partial pressure of CO(2). The calculated compositions were compared with measured values obtained from lysimeters filled with Pachappa soil, cropped with alfalfa, and irrigated with eight synthetic waters typical of rivers in the western U.S. Linear regression analysis of predicted vs. measured values for Na(+) and SO4(2-) concentrations, sodium-adsorption-ratio, electrical conductivity, and salt burden resulted in essentially one-to-one relationships. The gain in salt burden of drainage water at high leaching fractions due to mineral dissolution was adequately described by assuming the soil solution was saturated with respect to aragonite. Some evidence for Mg(2+) precipitation was found. The utility of the simulation model is demonstrated for evaluating the salinity, sodicity, and pollution hazards of irrigation waters. (Skogerboe-Colorado State)
W76-08671

PHOSPHORUS MOVEMENT IN SOILS: SOIL-ORTHOPHOSPHATE REACTION KINETICS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
L. T. Novak, and D. C. Adriano.
Journal of Environmental Quality, Vol. 4, No. 2, p 261-266, April-June 1975. 5 fig, 3 tab, 20 ref, append.

Descriptors: *Model studies, *Adsorption, *Phosphorus, *Waste water treatment, Soil water, Soil chemical properties, Soil chemistry, Kinetics.
Identifiers: *Desorption, Orthophosphates.

Four models are presented to describe the kinetics of P adsorption-desorption reactions in soils. The mass transfer model, Langmuir kinetics model, and Langmuir-Hinshelwood models were developed and compared with phosphate adsorption data on a soil obtained by batch-shaken flask experiments. For P adsorption times up to 3 hours, the mass transfer and Langmuir kinetics models described the experimental data very well. The Langmuir kinetics model gave a slightly better fit of the experimental data. These kinetic data probably represent an upper bound for unsaturated flow in soils. (Skogerboe-Colorado State)
W76-08672

EFFECTS OF FOREST FERTILIZATION ON TWO SOUTHEAST ALASKA STREAMS,
National Environmental Research Center, College, Alaska. Arctic Environmental Research Lab.
W. R. Meehan, F. B. Lotspeich, and E. W. Mueller.
Journal of Environmental Quality, Vol. 4, No. 1, p 50-55, January-March 1975. 7 fig, 9 ref.

Descriptors: *Water quality, *Alaska, *Nitrogen, Watersheds(Basins), *Fertilization, Forest management, Streams.
Identifiers: Stream pollution, *Forest fertilization.

Four streams in southeast Alaska were studied to determine the effects of forest fertilization with urea on basic productivity and water quality. An initial, short-term increase in ammonia-nitrogen levels was observed in the treated streams, and nitrate-nitrogen levels increased and remained high compared to control stream levels during the year following treatment. Concentrations did not approach those considered toxic to aquatic life or unsafe for human consumption. Changes in biomass of periphyton and benthic fauna as a result of fertilization were not detected. (Skogerboe-Colorado State)
W76-08673

THE IMPACT OF MOLYBDENUM-ENRICHED IRRIGATION WATER ON AGRICULTURAL SOILS NEAR BRIGHTON, COLORADO,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
D. R. Jackson, W. L. Lindsay, and R. D. Heil.
Journal of Environmental Quality, Vol. 4, No. 2, p 223-229, April-June 1975. 10 fig, 4 tab, 25 ref.

Descriptors: *Irrigation water, *Molybdenum, *Soil chemistry, Soil investigations, Agriculture, Colorado, Alfalfa, Water pollution sources.

The Mo concentration in water, soils, and alfalfa was monitored for one growing season to determine the impact of using Mo-enriched irrigation water near Brighton, Colorado. The concentration of Mo in irrigation water in this area ranged from 27 to 213 ppb. A significant increase of Mo concentration in alfalfa and available soil Mo was observed at one site irrigated with water containing 213 ppb Mo. The Mo concentration in the alfalfa at this site increased during the growing season from 4.3 to 7.2 ppm. This level is below the 10 ppm level considered toxic to livestock. Plant Mo was highly correlated (r=0.94) with resin-extractable Mo in a greenhouse experiment using soils from three of the field sites. Field results were less satisfactory (r=0.51), partially due to limited indigenous levels of Mo in the soils. A simulation model was used to assess the potential hazards of irrigating with water containing from 0 to 600 ppb Mo. The impact of Mo on the Brighton area during one growing season was minimal in relation to uptake of Mo by plants. Further studies are necessary to assess the long term effects of Mo accumulation in soils and irrigated with Mo-enriched waters. (Skogerboe-Colorado State)
W76-08675

COMPARISON OF TWO PREDICTIVE NONEQUILIBRIUM ONE-DIMENSIONAL MODELS FOR PHOSPHORUS SORPTION AND MOVEMENT THROUGH HOMOGENEOUS SOILS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
C. G. Enfield, and D. C. Shew.
Journal of Environmental Quality, Vol. 4, No. 2, p 198-202, April-June 1975. 5 fig, 1 tab, 21 ref.

Descriptors: *Phosphorus, *Sorption, *Diffusion, *Simulation analysis, *Model studies, Kinetics, Soil chemistry, Soil investigations, Agriculture, *Path of pollutants.
Identifiers: *Phosphorus sorption.

Two models were tested for their ability to predict phosphorus breakthrough curves. The basic difference between the two models is the method of describing the kinetics of sorption. It was found, when comparing theoretically predicted breakthrough curves with experimental breakthrough curves, that the model using a kinetic equation produced a better fit to the experimental data than a first order rate equation. (Skogerboe-Colorado State)
W76-08677

THE NITROGEN BALANCE OF ARCTIC TUNDRA: PATHWAYS, RATES, AND ENVIRONMENTAL IMPLICATIONS,
Alaska Univ., College. Inst. of Marine Science.
R. J. Barsdate, and V. Alexander.
Journal of Environmental Quality, Vol. 4, No. 1, p 111-117, January-March 1975. 3 fig, 5 tab, 43 ref.

Descriptors: *Nitrogen, *Alaska, *Leaching, *Denitrification, Ecosystems, *Path of pollutants, Arctic.
Identifiers: *Arctic ecosystems.

The magnitude of the inputs and exports of nitrogen was extimated for the tundra ecosystem at Barrow, Alaska. Based on new data and on previous investigations, annual input of nitrogen from all sources was 92.4 mg N/m(2) per year, with the most important sources being nitrogen fixation (75%) and ammonia in summer rain (18%). The low input of nitrogen by rain and snow results from both low annual precipitation and extremely low concentrations of nitrogen compounds in precipitation. Despite the meager nitrogen supply, the estimated retention is over 80% of the input reflecting insignificant leaching due to the impermeable permafrost substrate, low precipitation, and restricted lateral movement of water over and through the nonfrozen soils. Denitrification also is low, at least partially due to nutrient deficiency. Interpretations of these data in respect to the sensitivity of the environment to perturbations suggest that resource development or other activities which would have minor or negligible effects in temperate latitudes, could alter substantially the nitrogen balance of this arctic ecosystem. (Skogerboe-Colorado State)
W76-08678

WATER QUALITY IN IRRIGATED WATERSHEDS,
California Univ., Riverside. Dept. of Soil Science Agricultural Engineering.
R. L. Branson, P. F. Pratt, J. D. Rhoades, and J. D. Oster.
Journal of Environmental Quality, Vol. 4, No. 1, p 33-40, January-March 1975. 1 fig, 5 tab, 40 ref.

Descriptors: *Return flow, Irrigation, *Irrigation effects, Drainage water, *Agricultural watersheds, Surface runoff, *Water quality, Irrigation water, Watershed management.

Historically, attention to water quality in irrigated watersheds has been focused on irrigation waters and the relationships of their chemical composition to soil permeability and crop production. Recently, because of environmental concerns, it has become necessary to look beyond the quality of irrigation waters and consider also the quality of waters that drain from irrigated lands. Irrigation agriculture affects drainage-water chemical composition. In turn, drainage waters can influence the quality of receiving waters which may have a variety of beneficial uses to be protected. The two types of drainage waters from irrigated lands, surface runoff and subsurface drainage or percolation water, are characteristically different in composition and chemical concentration. The pollution potential of subsurface drainage waters, with respect to nitrate and total soluble salts is a particular concern. Studies of individual field conditions are providing information that can be extrapolated to show the effects of watershed management on ultimate water quality in receiving stream or ground water. A new concept has been developed concerning irrigation water management to minimize the quantity of salt discharged from irrigated lands and thereby help alleviate water quality degradation associated with disposal of salt-laden subsurface drainage waters. (Skogerboe-Colorado State)
W76-08679

NITRATE, PHOSPHATE, AND POTASSIUM MOVEMENT INTO DRAINAGE LINES UNDER THREE SOIL MANAGEMENT SYSTEMS,
Florida Univ., Fort Pierce. Inst. of Food and Agricultural Science.
D. V. Calvert.
Journal of Environmental Quality, Vol. 4, No. 2, p 183-186, April-June 1975. 3 fig, 4 tab, 13 ref.

Descriptors: *Nitrates, *Phosphates, *Potassium, *Drainage water, *Drainage, *Leaching, Lime, Soil investigations, Fertilizers, Irrigation, Agriculture, Florida, Soil management.
Identifiers: *Tillage depth, Orthophosphates.

Nitrate, orthophosphate, and potassium concentrations in drainage water were determined from subsurface drains installed in shallow-tilled (ST), (15 cm); deep-tilled (DT), (107 cm); and deep-tilled and limed (DTL) Florida Oldsmar sand planted to citrus. Total discharge of NO(3)-N was significantly greater from ST plots than either DT or DTL plots. Peak concentrations and discharge of fertilizer nutrients were shown to be a function of rainfall, irrigation, and timing of fertilizations. Deeply incorporated limestone applications into the subsoil tended to increase the NO(3)-N and decrease PO(4)-P discharged over that from deep tillage alone. (Skogerboe-Colorado State)
W76-08680

CHLORINATED HYDROCARBON PESTICIDES AND MERCURY IN COASTAL BIOTA, PUERTO RICO AND THE U.S. VIRGIN ISLANDS--1972-74,
Georgia Univ., Brunswick. Marine Resources Extension Center.
R. J. Reimold.
Pesticides Monitoring Journal, Vol. 9, No. 1, p. 39-43, 1975. 2 fig., 2 tab., 9 ref.

Descriptors: *Pesticide residues, *Baseline studies, *Mercury, *Chlorinated hydrocarbon pesticides, *Biota, Coasts, *Puerto Rico, *Virgin Islands, DDT, DDE, Dieldrin, Estuaries, Aroclors.
Identifiers: Carribean.

A biannual survey of selected Caribbean coastal waters off Puerto Rico and the Virgin Islands (St. John, St. Thomas, and St. Croix) was initiated in 1972 to determine the concentrations of chlorinated hydrocarbon pesticides (dieldrin, DDT, DDE, TDE, and polychlorinated biphenyls) and mercury in estuarine and marine fauna and

flora. Of 150 biota samples studied, 41% had significant amounts of mercury or chlorinated hydrocarbons. The concentrations suggested spatial and temporal variations in plants and animals. Sometimes the residues in the biota could be related to land-use practices in the watershed. DDT and dieldrin had been used on St. John's Island near Coral Bay for an insect control program and were found in fauna collected in the bay. Aroclor 1254 was found in red mangroves on the west side of St. Croix; the source is not known, but because of the distribution patterns and because residues were present at low trophic levels in the primary producers and detrivores, the source may have been local. As yet it is not possible to determine if the concentrations of the pollutants measured in these studies are increasing, decreasing, or remaining constant. However, these data do establish baseline conditions for future comparisons in these relatively uncontaminated areas. (Buchanan-Davidson-Wisconsin).
W76-08683

LAKE ERIE AND ITS BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-08723

CONTINUOUS DYNAMICAL COMPUTATIONS OF WATER TRANSPORTS IN LAKE ERIE FOR 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-08724

SURFICIAL SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08725

RATES OF ACCUMULATION OF PHOSPHORUS FORMS IN LAKE ERIE SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08726

CULTURAL IMPACT ON THE GEOCHEMISTRY OF SEDIMENTS IN LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-08727

TRANSIENT WATER QUALITY MODELING IN STREAMS,
Cornell Univ. Ithaca, N. Y. School of Civil and Environmental Engineering.
R. Willis, D. R. Anderson, and J. A. Dracup.
Water Resources Bulletin, Vol. 12, No. 1, p 157-174, February 1976. 4 fig, 1 tab, 17 ref.

Descriptors: *Water quality control, Analytical techniques, *Model studies, *Systems analysis, *Oxygen demand, *California, Numerical analysis, Reaeration, Photosynthesis, Computer models, Data processing, *Nitrogen cycle, Nutrients, Environmental engineering, Water quality, Management, Streams, Canals, Waste assimilative capacity.
Identifiers: *Organic nitrogen, *Truckee River(Calif), Implicit finite difference approximation.

A general planning model for simulation of water quality in streams and canals was formulated and verified. The model simulated the temporal and spatial variations in conservative and nonconservative constituents. The nitrogen cycle and its interaction with other nutrients and the dissolved oxygen resources of the stream were included. A fully implicit finite difference approximation was used to solve the mass transport equations describing variations in constituent concentrations throughout the stream systems. The model is a flexible planning tool for the rapid evaluation of transient water quality conditions in streams and rivers. Treatment levels and quality conditions throughout the system can be easily varied by the planner or system manager. The model was applied to the Truckee River in northern California. Results indicated the applicability of the model for assessing the impact of alternative water quality management strategies on the stream system. Although the data requirements are substantial, the model provides the planner for arriving at satisfactory water quality control measures. (Singh - ISWS)
W76-08730

ONE-DIMENSIONAL TEMPERATURE PREDICTIONS IN UNSTEADY FLOWS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
D. N. Brocard, and D. R. F. Harleman.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11982, p 227-240, March 1976. 5 fig, 14 ref, 2 append. EPA R-800429.

Descriptors: *Model studies, *Thermal pollution, *Heat transfer, *Mathematical models, *Forecasting, Powerplants, Cooling water, Rivers, Reservoirs, Estuaries, Temperature, Water temperature, *Unsteady flow, Water quality, Dispersion, Meteorology, Hydraulics.
Identifiers: Waste heat.

One-dimensional temperature models are useful in assessing the environmental impact of waste heat discharges. The model considers both transient flow and meteorological conditions and is therefore applicable to actual rivers and estuaries. The equations governing the flow and the temperature distribution were reviewed and the role and determination of the dispersion coefficient was examined. The fluxes participating in the overall heat budget of a water body were individually considered and formulas were given to evaluate them. The nature of the necessary boundary conditions was considered and a case study was presented where the natural temperature distribution in the Conowingo Reservoir was predicted and compared to actual measurements. (Sims - ISWS)
W76-08738

NUMERICAL PREDICTION OF THERMAL-REGIME OF RIVERS,
Nalco Environmental Sciences, Northbrook, Ill. Physical Science Div.
P. P. Paily, and E. O. Macagno.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11997, p 255-274, March 1976. 8 fig, 2 tab, 6 ref, 3 append. NSF GK-35910X.

Descriptors: *Model studies, *Thermal pollution, *Heat transfer, *Mathematical models, *Forecasting, Rivers, Powerplants, Cooling water, Temperature, Water temperature, Unsteady flow, Water quality, Winter, Ice, Meteorology, Hydraulics, Hydrodynamics, Mississippi River, Illinois.
Identifiers: Waste heat.

The one-dimensional form of the unsteady convection-diffusion equation adequately describes the thermal-regime of rivers for fully mixed flow conditions. In general, it is not easy to develop closed-form solutions of this nonlinear partial parabolic equation. Thus, a numerical solution, based on a predictor-corrector scheme, was developed for this equation, which can be applied for predicting the thermal response of natural and heated rivers under variable meteorological factors and transient thermal discharge and flow conditions. Result of a field investigation conducted in the Mississippi River near Cordova, Illinois, during winter was presented, along with a comparison of the measured and predicted steady-state temperature distributions in the river. (Sims - ISWS)
W76-08739

THREE-DIMENSIONAL POLLUTANT MODELING IN SHEAR FLOW,
Tetra Tech, Inc., Pasadena, Calif.
G. T. Yeh.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 12005, p 351-365, March 1976. 4 fig, 1 tab, 14 ref, 2 append.

Descriptors: *Model studies, *Water pollution sources, *Turbulent flow, Mathematical models, Diffusion, Rivers, Pollutants, Flow, Turbulence, Shear, Mixing, Hydraulics.
Identifiers: *Shear flow, Three-dimensional models.

A steady-state three-dimensional turbulent diffusion equation with variable coefficients describing the concentration distribution of a substance from a point source in a shear flow field was solved analytically. A similar formulation may be developed for line, area, or other kinds of sources. Two models were considered: one treats both the depth and width of the water body as finite, while the other deals with finite depth but with infinite width. In the search for solutions, the integral transformation and the Green's function constructed earlier by the writer were utilized to the optimum advantage. The solutions were developed for cases in which the velocity and the vertical and lateral eddy diffusion coefficients were given by a power law. Results were compared with those obtained from the uniform flow field. They showed a significant difference in the concentration distribution. The magnitude of differences depends on the location of sources and the vertical variations of the velocity and the diffusion coefficients of the flow field. (Sims - ISWS)
W76-08740

DISTRIBUTIONS OF BOD AND DO IN RIVERS AND LAKES,
Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Ingenieria.
R. B. Banks.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE2, Proceedings Paper 12028, p 265-280, April 1976. 12 fig, 17 ref, 2 append.

Descriptors: *Biochemical oxygen demand, *Dissolved oxygen, *Mexico, Surface waters, Environmental engineering, *Mathematical models, Aeration, Waste treatment, Oxygen, Oxygen requirements, Water circulation, Water pollution, Organic matter, Water quality, Lakes, Rivers, Model studies, Industrial wastes, Agricultural runoff, Equations, *Distribution patterns.
Identifiers: BOD distributions, DO distributions, *Lake Chapala(Mexico), *Oxygen sag, Deoxygenation, Mixing cell model, Velocity distributions.

The differential equations for horizontal distributions of biochemical oxygen demand (BOD) and dissolved oxygen (DO) were presented. In general, these equations cannot be solved. Therefore, a mixing cell model was developed, based on the assumption that the concentrations of BOD and DO throughout a cell are equal to their concentrations in the effluent from the cell. Two examples were given: (1) flow from a source and (2) flow from an infinite row of sources. Results obtained with the mixing cell model agreed closely with results given by solutions to the differential equations. The method was employed to determine distributions of BOD and DO in Lake Chapala, Mexico. Computed values were in fair agreement with measured values. (Henley-ISWS)

W76-08743

COMPUTER MAPPING OF TURBIDITY AND CIRCULATION PATTERNS IN SAGINAW BAY, MICHIGAN FROM LANDSAT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
R. H. Rogers, L. E. Reed, and V. E. Smith.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-26465, $3.50 in paper copy, $2.25 in microfiche. Special Report BSR 4183, March 1975. 15 p, 6 fig, 1 tab, 8 ref. NASA NAS5-20942.

Descriptors: *Water quality, *Lake Huron, Computers, *Satellites(Artificial), *Data collections, Remote sensing, *Turbidity, Physical properties, *Mapping, Water circulation, Nutrients, Dissolved solids, Heavy metals, Chlorophyll, Algae, Sampling, On-site data collections.
Identifiers: *Saginaw Bay(Mich), *ERTS, Clarity.

Computer techniques developed for mapping water quality parameters from ERTS data were demonstrated, using ground truth collected in an ongoing survey of water quality in Saginaw Bay, Michigan (Lake Huron) sponsored by the U. S. Environmental Protection Agency. Chemical and biological data were collected in concert with ERTS passes at 59 bay stations within the 2960 square kilometer test area. These ground truth measurements include water turbidity and clarity, chlorophyll, algal populations, total and dissolved nutrients, and metals. A technique for transforming Earth coordinates (latitude and longitude) of bay stations to ERTS tape coordinates (scan line and element number) was developed and applied to edit ERTS measurements near stations representative of a known water quality parameter. These spectral samples were used by the computer to produce geometrically-corrected color-coded imagery and maps of turbidity of the entire bay. These maps show nine discrete categories of turbidity, as indicated by nine Secchi depths between 0.3 and 3.3 meters. These maps and data, rapidly produced from ERTS data, provide an economical basis for extrapolating water quality parameters from point samples to unsampled areas. Furthermore, ERTS furnishes a synoptic view of water mass boundaries that no amount of ground sampling or monitoring can provide. (Morris-ISWS)
W76-08746

WATER QUALITY EFFECTS OF A DREDGING DISPOSAL AREA,
Northwestern Univ., Evanston, Ill. Technological Inst.
For primary bibliographic entry see Field 5C.
W76-08749

5C. Effects Of Pollution

BIOLOGICAL PROBLEMS OF A MANMADE SMALL LAKE, (IN GERMAN),
Innsbruck Univ. (Austria). Hygienisches Institut.
F. Tiefenbrunner, and E. Rott.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 160(3), p 268-285, 1975.

Descriptors: Lakes, *Algae, Biology, *Eutrophication, Europe, Hydrogen ion concentration, Seasonal, *Phytoplankton, Chlorophyta, *Phosphorus, *Artificial lakes.
Identifiers: Cyclotella, Microcystis-Flos-Aquae, Synedra.

A small bathing lake with (surface area = 3000 m2; volume = 7000 m3) which has been in existence for over 10 yr was studied July-Sept. A relatively constant H+ concentration (pH 8.2), small variations in electrolytic conductivity and 8 German degrees of hardness were found. The mean P level was 60 micrograms/l. The Pi levels ranged between 5.2-18.5 micrograms/l. O2-Saturation during the entire summer was greater than 100%. Altogether, 49 kinds of phytoplankton and 12 kinds of zooplankton were identified. The total biomass of phytoplankton was between 8.5-16 mg fresh weight/l; bacterial biomass varied between 4.5-9.5 mg/l. Unusual for summer conditions was the high proportion of Cyclotella and Synedra spp. among the phytoplankton mass; the algal bloom-producing Microcystis flos-aquae attained a maximum proportion of 15%. In spite of the variety of forms, green algae were present in small numbers only. According to various classification systems, the lake is eutrophic or b-mesosaprobic. The lake is probably rich in nutrients, but there is a relatively stable biological equilibrium so that there is no further threat of progressive eutrophication.--Copyright 1976, Biological Abstracts, Inc.
W76-08107

ADENOSINE TRIPHOSPHATASE ACTIVITY IN BRAIN, INTESTINAL MUCOSA, KIDNEY, AND LIVER CELLULAR FRACTIONS OF THE RED-EARED TURTLE FOLLOWING IN VITRO TREATMENT WITH DDT, DDD, AND DDE,
Middle Tennessee State Univ., Murfreesboro. Dept. of Biology.
F. G. Witherspoon, Jr., and M. R. Wells.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 5, p. 537-544, 1975. 4 fig., 7 ref.

Descriptors: *DDT, *DDD, *DDE, *Inhibition, Inhibitors, *Turtles, Biochemistry, *Enzymes, Analytical techniques, *Chlorinated hydrocarbon pesticides, Water pollution effects, *Toxicants, Mode of Action, Animal physiology, Pesticides, Insecticides, Phosphorus, Environmental effects, Cytological studies, Pollutant identification.
Identifiers: Tissue analysis, *Adenosine Triphosphate, Cellular components, Chrysemys scripta elegans.

Adenosine triphosphatase (ATPase) activity in cellular fraction of turtle tissues was determined by measuring the amount of inorganic phosphate produced by the conversion of ATP to ADP. DDT, DDD or DDE in concentrations of 53, 106 and 212 micromoles was added to the tissue homogenates. The data indicate highly significant inhibition of the (Na+, K+, Mg+2) dependent ATPase systems in all cellular fractions of the kidney, intestinal mucosa and brain (except for mitochondria in latter two) after in vitro treatment with 212 micromole DDT. DDE exhibited an unexpectedly high inhibitory effect and DDD did not share sites of inhibition with either DDT or DDE. This suggests a different mechanism of action. (Katz)
W76-08115

NITROGEN AND PHOSPHORUS LOSSES FROM WINTER DISPOSAL OF DAIRY MANURE,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
S. D. Klausner, P. J. Zerman, and D. F. Ellis.
Journal of Environmental Quality, Vol 5, No 1, p 47-49, 1976. 2 fig, 3 tab, 16 ref. EPA S800767.

Descriptors: *Nitrogen, *Phosphorus, *Surface runoff, *Farm wastes, Fertilization, New York, Winter, Agricultural runoff, Freezing, Rates of application, Snow cover, Thawing.

Surface runoff losses of inorganic nitrogen and total soluble phosphorus from fields at the Cornell Research Farm, Aurora, New York, winter fertilized by dairy manure were measured from January 1-March 31 in 1972, 1973, and 1974. Of primary importance were the rate of manure application (35, 100, and 200 metric tons/ha) and climatological variability. The average values of inorganic nitrogen in the liquid fraction of runoff for the three rates of application were 16, 1, and 0.2 kg/ha for the three years, respectively, and the average phosphorus runoff values averaged 3.7, 0.7, and 0.01 kg/ha. The soil was frozen for 62, 12 and 0 days in the respective years, and the longest freeze period was mainly responsible for the increased nutrient concentrations in the runoff. The results suggest that manure distribution during active thaw periods could cause greatly increased loss of nutrients. Such losses would be minimized if the manure is applied, then covered with snow which melts at a later date. When 35 metric tons/ha of manure were applied on frozen soil and then covered with snow, the nutrient losses were not very different from losses from areas than received no manure. (Buchanan-Davidson--Wisconsin)
W76-08159

DISTRIBUTION OF PLUTONIUM IN SOIL PARTICLE SIZE FRACTIONS OF LIQUID EFFLUENT-RECEIVING AREAS AT LOS ALAMOS,
Los Alamos Science Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W76-08160

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
G. Wood.
Australian Water Resources Council Technical Paper No. 15, 1975. 238 p. 8 fig., 16 tab., 585 ref.

Descriptors: *Eutrophication, *Australia, *Reviews, Water pollution control, Management, Research facilities, Water pollution effects.

Discussed in detail are the Australian environment, recent foreign eutrophication research, the basic concepts of trophic status and their applicability to Australian inland waters; the effects and problems associated with eutrophication, eutrophication problems in Australia, nutrient and other parameters contributing to the eutrophication process, including factors considered to be of particular importance in Australia. Attention is also focused on indices and measurement of eutrophy of Australian waters, management and control of eutrophication both in foreign countries and Australia, and the status of eutrophication in Australia, including current studies. The arid Australian climate with erratic and variable rainfall poses unique problems for that continent. Rivers, streams, lakes, coastlines, and underground aquifers are being polluted to the extent that some waterways can no longer be used except as sewers. A contributing factor is the population density on the coastlines, with annual growth of 2% per annum, and increasing urbanization inland. The lack of Australian research on limnology and eutrophication imperils its water resources. Some recommendations are that research on all aspects of limnology and baseline data be accelerated; enhanced communication between researchers with prompt publication of research results; and that a central depository be maintained in each state and territory for all pertinent literature. (Auen-Wisconsin)
W76-08162

AN ECOLOGIC SURVEY OF LAKE ENDINE, (IN ITALIAN),
L. Barbanti, C. Bonacina, A. Calderoni, A. Carollo, and R. De Bernardi.
304p. Edizioni dell'Istituto Italiano di Idrobiologia: Italy. 1974.

Descriptors: *Ecology, *Surveys, Lakes, Europe, *Phytoplankton, Primary productivity, Seasonal, Distribution, Benthos, Water pollution, Zooplankton.
Identifiers: Macrophytes, *Italy(Lake Endine).

Hydrological, meteorological and physicochemical data on this Italian lake are provided. A list of phytoplanktonic species is given and primary

production examined. Seasonal variation and distribution of macrophytic, zooplanktonic and benthic organisms were studied in relation to pollution of the lake and its control.--Copyright 1976, Biological Abstracts, Inc.
W76-08244

ECOLOGY OF THE ZOOPLANKTON IN THE GULF OF CARIACO. PART I: VARIABILITY OF THE BIOMASS OF THE ZOOPLANKTON DURING THE PERIOD FROM AUGUST TO NOVEMBER, 1973, (IN SPANISH),
Indian Ocean Biological Centre, Cochin (India); and National Inst. of Oceanography, Cochin (India).
T. S. S. Rao, and L. J. Urosa.
Bol Inst Oceanogr Univ Oriente Cumana. 13(1/2), p 67-78, 1974.

Descriptors: *Biomass, *Zooplankton, Productivity, *Ecology, Gulfs, Standing crops.
Identifiers: *Venezuela(Gulf of Cariaco).

Zooplankton biomass values are given, based on 119 collections made during Aug.-Nov. 1973. This period represents the lean period of zooplankton production and standing crop in the Gulf (Venezuela), against a background of stable hydrographic conditions. Values were subjected to statistical analysis and the data probably represent a valid estimate of zooplankton biomass. Biomass varied between 64.2 and 142.6 cc/1000 m3, indicating that the Gulf has high zooplankton standing crop as compared to other areas. The ratio between displacement volume, wet weight and dry weight, is compared with results obtained elsewhere and there are wide differences.--Copyright 1976, Biological Abstracts, Inc.
W76-08247

NEW METHODS FOR ECOLOGICAL ANALYSIS OF MICROORGANISMS OF EUTROPHIC WATERS, (IN SPANISH),
Institute National de Limnologia, Santo Tome (Argentina).
For primary bibliographic entry see Field 5A.
W76-08252

INFLUENCE OF THE LOCAL PRECIPITATION QUANTITY ON THE LOADING OF WATER BODIES WITH MIXED WATER (DER EINFLUSS DER OERTLICHEN NEIDERSCHLAGSHOEHE AUF DIE BELASTUNG DER GEWAESSER MIT MISCHWASSER),
For primary bibliographic entry see Field 5B.
W76-08258

TOXIC ACTION OF COPPER ON THE GILLS OF CARP (CYPRINUS CARPIO), (IN FRENCH),
Lab. Ecophysiol. Anim., Univ. Paul-Sabatier, Toulouse, Fr.
R. Labat, J. Pequignot, and A. Chatelet.
Ann Limnol. 10(1); p 109-114, 1974.

Descriptors: *Carp, *Copper, Toxins, Fish toxins, Water pollution effects, *Toxicity.
Identifiers: *Gills(Carp).

Histological changes in carp gill structure were observed after poisoning by copper salt. Cu (an environmental toxicant) induced mucous cell depletion, followed by mucosecretion inhibition, recovering only after a return to normal conditions.--Copyright 1975, Biological Abstracts, Inc.
W76-08260

BIOLOGICAL CHANGES IN THE SOUTH ST. PAUL SEWAGE TREATMENT PLANT BEFORE AND AFTER TREATMENT WITH FECL3 AND NALCOLYTE 675 COAGULATING AGENTS,
Saint Cloud State Coll., Minn. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W76-08290

STUDIES ON THE HOST SPECIFICITY OF THE EYEFLUKE DIPLOSTOMUM SPATHACEUM, IN BROWN AND RAINBOW TROUT,
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat.
C. Betterton.
Parasitology. 69(1), p 11-29, 1974.

Descriptors: *Rainbow trout, *Brown trout, *Fish diseases, Europe, Fish parasites, Fish migration, Fish forming.
Identifiers: Diplostomum-Spathaceum, England, *Eyefluke.

Trout collected from a trout farm in Essex, England, were infected with D. spathaceum. Yearling rainbow trout were blinded with heavy infections of eyefluke, whereas brown trout of the same age carried 1/10 the number of flukes and were clear eyed. Both species were reared under identical conditions, in parallel rearing channels which received water from a common source. Young fish exhibited a similar differential in their infestations, and rainbow trout did not appear to be age-resistant. Laboratory infections produced by exposure of fish to suspensions of cercariae and injection of cercariae into the body cavity reflected the field results, indicating that ecological factors were not involved. Recovery of cercariae from host tissues, and histological observations of similar numbers entering both hosts, showed that cercariae were able to survive penetration. Excised eye preparations were equally susceptible to infection. Fry (2 cm) of both species were highly susceptible. Migration in brown trout took 3 h longer than in rainbow trout of the same size; many cercariae were found in the heart during this time. Two mechanisms of insusceptibility were suggested: a greater impenetrability of brown trout tissues and disorientation of migrating cercariae in brown trout.--Copyright 1975, Biological Abstracts, Inc.
W76-08302

THE EFFECT OF CONTROLLED EUTROPHICATION ON SOLAR RADIATION PENETRATING INTO PONDS, (IN POLISH),
Polish Academy of Sciences, Golysz. Fish Culture Station.
M. Szumiec.
Acta Hydrobiol. 17(2), 149-181, 1975.

Descriptors: *Eutrophication, *Ponds, *Solar radiation, Lakes, Distribution patterns, Europe, Fish, Production, Surfaces.
Identifiers: *Poland, Solar energy(Ponds).

Time and vertical solar energy distribution in ponds depends on the solar radiation of the surface and on changes of water transparency resulting from variable intensification of fish production. The possibility of theoretical calculations of the solar energy at the pond surface under local conditions was checked, the daily and seasonal cycles being analyzed. The field of solar radiation inside the ponds was presented as a continuous function of time and depth. The results concerning the characterization of time and vertical distribution in the solar radiation in Polish lakes are discussed.--Copyright 1976, Biological Abstracts, Inc.
W76-08305

FOOD HABIT OF VORTICELLIDAE ISOLATED FROM ACTIVATED SLUDGE,
Tokyo Univ. (Japan). Inst. of Applied Microbiology.
For primary bibliographic entry see Field 5D.
W76-08309

PLANKTONIC ECOSYSTEMS: THE EFFECTS OF DYSTROPHIC CONDITIONS ON STRUCTURE AND FUNCTION IN THE GULF OF FOS, (IN FRENCH),
Aix-Marseille-Univ. (France). Laboratoire d'Hydrobiologie.
F. Blanc, M. Leveau, and M. C. Bonin.
Int Rev Gesamten Hydrobiol. 60(3), p 359-378, 1975.

Descriptors: *Ecosystems, Gulfs, Plankton, *Diatoms, *Dinoflagellates, Primary productivity, Zooplankton, Europe, *Dystrophy, Effluents, Industrial wastes.
Identifiers: Acartia, Exuviaella, Prorocentrum, Skeletonema-Cos-tatum, *France(Gulf of Fos).

In the areas studied, an unusual structure and dynamic behavior was exhibited by the plankton ecosystems, due to industrial and natural effluents from the Rhone and Durance (France). The ecosystem is at a low state of maturity, characterized by frequent periods of intense multiplication by small species with high metabolic rates, such as the diatom Skeletonema costatum and the dinoflagellates Exuviaella and Prorocentrum. Brackish water seems to support their proliferation. The turnover rates of the populations decrease as they become older and cell size increases. A lack of competition by species of the same genus is a characteristic of the photoautotrophic organisms in these environments. Secondary production follows the same cycle as the primary production by the dinoflagellate population. Zooplankton (Acartia) have periods of intensive development in these areas.--Copyright 1976, Biological Abstracts, Inc.
W76-08312

FINE-DISPERSED FRACTION OF SUSPENDED ORGANIC MATTER IN THE EAST PACIFIC WATERS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Insstitut Okeanologii.
I. A. Mel'nikov.
Okeanologiya. 15(2), p 266-271, 1975.

Descriptors: *Organic matter, *Suspended solids, Pacific Ocean, Eutrophication, Distribution, Food chains, Plankton, Detritus.
Identifiers: Heterotrophic organisms, *Organic carbon.

In the euphotic zone of the highly productive water this fraction comprises 86%, in the less productive water it is 61%, and below 200 m it is 53% of the organic C of suspended matter. The formation of the fine-dispersed fraction and its role in the energy distribution of the detritus food chain in the ecosystem (heterotrophic single-celled organisms, filtering plankton, predators) are discussed.--Copyright 1976, Biological Abstracts, Inc.
W76-08314

INTRODUCTION TO HYDROBIOLOGY. HYDROBIOLOGY: A COMPENDIUM FOR ENGINEERS AND NATURAL SCIENTISTS, (IN GERMAN),
D. Uhlmann.
345 p. Illus. VEB Gustav Fischer Verlag: Jena, East Germany. 1975.

Descriptors: *Hydrobiology, *Metabolism, *Aquatic animals, *Growth rates, *Self purification, Bioindicators, Oxygen, *Sewage treatment, Waste water treatment, Inland waters, Temperature.
Identifiers: *Oxygen balance.

The 1st 2 sections examine the metabolism of aquatic organisms and the uniformity and biotope dependency of the growth of aquatic organisms. The 3rd chapter deals with faunal and floral colonization of flowing an stagnant inland waters and sludge stabilization, and part 4 concerns biological self-purification and the effect of artificial temperature control, indicator organisms and O2 balance. The function of water as a biochemical reactor, water pollutability, its reactions to disturbances and the repair of damaged aquatic ecosystems comprise the next 3 chapters. The ac-

tivities of the microorganisms used in sewage treatment plants and those of organisms present in water supply facilities constitute the final 2 sections.-Copyright 1976, Biological Abstracts, Inc.
W76-08315

DETERMINATION OF BIOLOGICAL DEGRADABILITY OF ORGANIC SUBSTANCES,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
For primary bibliographic entry see Field 5B.
W76-08351

A SIMPLE CONTINUOUS-FLOW RESPIROMETER FOR COMPARATIVE RESPIRATORY CHANGES IN MEDIUM-SIZED AQUATIC ORGANISMS,
Texas Christian Univ., Fort Worth. Dept. of Biology.
D. J. Arnold, and D. E. Keith.
Water Research, Vol. 10, No. 3, p. 261-263, 1976. 2 fig., 10 ref.

Descriptors: *Measurement, *Respiration, *Crustaceans, *Aquatic animals, *Fish, Metabolism, Equipment, Shiners, Crabs, Oxygen requirements, Salinity.
Identifiers: *Respirometers.

The respirometer is simple, inexpensive and can accommodate medium size animals (fish, crustaceans). Because low oxygen tensions and increases in metabolites can affect an organism's respiratory rate, a continuous-flow system which minimizes these effects is advantageous. The apparatus can be easily constructed, can be adapted to various flow rates, aquatic organisms, and experimental designs. Both this system and a static system, which used a series of sealed glass containers as closed respirometers, showed linear relationships between increasing numbers of golden shiners, Notemigonous crysoleucas, of the same size and weight, and oxygen consumption rate. The static system was satisfactory for small animals and simpler to operate, but the continuous-flow system was preferable for larger organisms. The continuous-flow system was used successfully to demonstrate effects of salinity changes on respiratory rates of the blue crab, Callinectes sapidus. There was a rapid increase in oxygen consumption at low salinities in crabs previously acclimated to 30% salinity, followed by a decrease to levels approximating respiration at 15% salinity. The continuous-flow method should be applicable to studies on the effects of industrial toxins on metabolic rates of aquatic animals. (Buchanan-Davidson--Wisconsin).
W76-08353

EUTROPHICATION OF MICROPONDS,
Agricultural Research Service, Fort Collins, Colo.
A. R. Batchelder.
Journal of Environmental Quality, Vol. 4, No. 4, p. 52-526, 1975. 3 fig., 6 tab., 14 ref.

Descriptors: *Eutrophication, *Nutrients, *Farm ponds, Bottom sediments, Soil types, Biomass, Soil chemical properties, Aquatic soils, Algae, Growth rates, Conductivity, Hydrogen ion concentration, Crop production.

In order to understand farm pond eutrophication, research was conducted to define mechanisms and magnitudes of nutrient regeneration from bottom sediments and to determine the effects of plants and other organisms on nutrient transfer mechanisms. Nutrient-supplying abilities of three soils, considered representative of farm pond-bottom soils, to overlying waters and effects of biomass production were studied. The soils, which had different chemical and physical properties, were flooded with deionized water and used as bottom soils for greenhouse microponds. The submeged soils supplied enough nutrients to overlying waters during two successive flooding of 219 and 270 days to sustain algal growth for 489 days. Electrical conductivities, pH, and nutrient concentrations differed between the soils and a control nutrient solution. Indigenous algae prevailed in the soil systems during the first flooding. The dominant algal genera were less diversified during the second flooding. When perennial rye grass was grown on the same soils, yields per kilogram soil could not be related to ash-free biomass yields per kilogram soil in the microponds. Algal growth could not be predicted from soil characteristics, solution composition, or cropped soil productivities, but submerged soils can serve as the sole source of algal nutrients. (Buchanan-Davidson--Wisconsin).
W76-08354

A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS,
Agricultural Research Service, Watkinsonville, Ga.
For primary bibliographic entry see Field 5B.
W76-08356

FACTORS AFFECTING THE CONTRIBUTION BY EPIPHYTIC ALGAE TO THE PRIMARY PRODUCTIVITY OF AN OLIGOTROPHIC FRESHWATER LAKE,
Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Environmental Engineering.
R. B. Sheldon, and C. W. Boylen.
Applied Microbiology, Vol. 30, No. 4, p. 657-667, 1975. 5 fig., 7 tab., 31 ref. NSF AG-199, EMS 69-01147 A09

Descriptors: *Periphyton, *Limiting factors, *Primary productivity, *Carbon, Lakes, Algal, Growth rates, Diatoms, *New York, Aquatic plants, Water temperature, Light intensity, Bicarbonates, Seasonal, Littoral, Summer, Eutrophication, Winter, Photosynthesis, *Oligotrophy, Diurnal, Nutrients.
Identifiers: *Epiphytes, *Lake George(NY).

To determine factors limiting epiphyte growth and to measure their contribution to primary productivity, a diatom-dominated population of epiphytic algae was studied in Lake George, New York. Samples were taken during the spring, summer and fall at 3 m where macrophytes were most productive. Algae showed an optimum temperature for radioactive bicarbonate uptake at 30 C, but summer littoral lake temperatures were 18-25 C. Light saturation occurred at a 8,608 lux intensity, approximately the intensity at the depth where algae were found. Epiphytes showed a maximum photosynthetic capacity in the early afternoon in mid-August. They assimilated approximately 5% as much inorganic carbon as macrophytes from which they were obtained. Epiphyte population densities followed macrophyte seasonal growth patterns; maximal leaf colonization was essentially constant compared to leaf position on plants. There was little change in density between sampling sites at any given time. Epiphyte productivities from bottom leaves were 10-times higher than from top leaves. Phosphates, nitrates, ammonia, silica, and sulfates did not stimulate photosynthesis, but bicarbonates did, suggesting that carbon may be the limiting nutrient for the epiphytic algae in Lake George. The role of algal epiphytes on primary productivity becomes more important as aquatic ecosystems become more eutrophic. (Buchanan-Davidson--Wisconsin)
W76-08357

SELF-PURIFICATION CAPACITY OF IMPOUNDMENTS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Laborator.
V. Straskrabova.
Water Research, Vol. 9, No. 12, p. 1171-1177, 1975. 3 fig, 5 tab, 28 ref.

Descriptors: *Self-purification, *Impoundments, *Biochemical oxygen demand, Eutrophication, Algae, Reservoirs, Organic loading, Organic matter, Equations, Inflow, Depth, Retention, Discharge(Water), Decomposing organic matter, Europe.

Recent eutrophication studies have emphasized the potential hazards of heavy algal productions in reservoirs which may interfere with the evaluation of the self-purification capacity. Statistical evaluations of data on organic matter budgets of reservoirs could suggest parameters governing the self-purification capacity. Total input of organic substances into impoundments includes inflow and algal production. With the same algal production per unit area, the relative importance of total input increases with decreasing mean depth, increasing retention time, and decreasing inflow concentration. The percentage of the total input remaining in the outflow is related to retention time. The amount remaining in the outflow is not affected by seasonal temperatures or autochthonous to allochthonous input ratio. Inflow concentration had no significant effect. In reservoirs with 19-203 day retention times, the percentage of organic matter in the outflow could be directly correlated with mean depth. In reservoirs with retention times up to 5 days, the biochemical oxygen demand in the outflow could be predicted from inflow known. Autochthonous production in reservoirs with longer retention times should be considered when predicting the outflow concentration. (Buchanan-Davidson--Wisconsin)
W76-08358

CHLORINATED PESTICIDES AND POLYCHLORINATED BIPHENYLS IN MARINE SPECIES, OREGON/WASHINGTON COAST, 1972,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
For primary bibliographic entry see Field 5A.
W76-08359

MERCURY CONCENTRATIONS IN FISH, NORTH ATLANTIC OFFSHORE WATERS--1971,
National Marine Fisheries Service, Milford, Conn. Milford Lab.
For primary bibliographic entry see Field 5A.
W76-08360

CONSIDERATIONS OF TESTING THE ACCUMULATION OF PESTICIDES BY MEANS OF ARTIFICIAL FOOD CHAINS,
Hamburg Univ. (West Germany). Institut fuer Hydrobiologie und Fischereiwissenschaft.
For primary bibliographic entry see Field 5A.
W76-08361

BEHAVIOUR OF OIL UNDER CANADIAN CLIMATIC CONDITIONS. PART 1. OIL ON WATER UNDER ICE-FORMING CONDITIONS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5B.
W76-08365

PYRAMID LAKE: ZOOPLANKTON DISTRIBUTION AND BLOOMS OF THE BLUE GREEN ALGA, NODULARIA SPUMIGENA,
Nevada Univ., Reno. Desert Research Inst.
D. Koch, L. Hoffman, and J. Mahoney.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 529, $4.50 in paper copy, $2.25 in microfiche. Water Resources Center, Project Report No. 38, January 1976. 46 p, 14 fig, 9 tab, 35 ref. OWRT B-069-NEV(1) 14-31-0001-4105.

Descriptors: *Eutrophication, Surface waters, Plankton, Water quality, Fish, Aquatic algae, *Nevada, *Zooplankton, *Cyanophyta, Distribution, Lakes, *Algal toxins, Water pollution effects.
Identifiers: *Pyramid Lake(Nev), Nodularia spumigena.

The interrelationships of the Pyramid Lake, Nevada algae bloom with zooplankton populations and fishes in the lake were studied. The objective was to evaluate the effect of the large Nodularia spumigena bloom upon the fishes indirectly through analysis of zooplankton populations during algae bloom. It is believed that algae produce toxins during bloom conditions; this study was implemented to determine if the algae do produce toxins and what influence they might have on the lower levels of the food chain. Results showed that looking at zooplankton and Nodularia populations structures together, the alga did not appear to produce a toxin that might indirectly influence larval fish through effects on zooplankton populations. When water temperature is highest in late summer, light intensity is high, and nutrients accumulate in the surface waters; these help sustain algal growth. Thus Nodularia spumigena effectively acts as a biogenic agent in removal of nutrients from surface waters which settle to the lake bottom. Lake waters are aerated well enough that dissolved oxygen depletions do not occur in the bottom waters indicating biogenic activity within the lake is efficient and the eutrophic state of the lake is moderate. Nodularia spumigena does not have an extreme effect on the zooplankton of Pyramid Lake, except perhaps by inducing a physical crowding problem that inhibits zooplankton grazing in surface waters.
W76-08374

PREPARATION OF PLANS AND SPECIFICATIONS FOR POLLUTION ABATEMENT ACTIVITIES IN CHERRY CREEK WATERSHED, MARYLAND.
Skelly and Loy, Harrisburg, Pa.; and Zollman Associates, Inc., Baltimore, Md.
For primary bibliographic entry see Field 5G.
W76-08385

DEVELOPMENT OF AN OVERALL ECONOMIC/ENVIRONMENTAL PLAN FOR THE MONONGAHELA RIVER BASIN.
Gibbs and Hill, Inc., New York.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 790 $8.50 in paper copy, $2.25 in microfiche. Prepared for the Appalachian Regional Commission, Washington, D.C., September 1974. 244 p, 10 fig, 36 tab, 6 append. EPA 14010-HQC-3.

Descriptors: *Acid mine water, *Mine water, Waste water(Pollution), Water pollution sources, *Land use, *Mine drainage, *Coal mine wastes, *Strip mine wastes, Abatement, *Water pollution control, *Air pollution, *Pollution abatement, *Appalachian Mountain Region, Mine acids, Water pollution, Pennsylvania, Maryland, West Virginia, Economic impact, Cost-benefit analysis, *Engineer estimates, *Alternative planning.
Identifiers: *Monongahela River Basin, Vehicular emissions.

Specific problem areas discussed are: (1) water pollution-mine drainage, sewage treatment, industrial waste, siltation, urban runoff; (2) air pollution-coal mine refuse seam fires, power plants and processing plants, heating loads, vehicular emissions; (3) land problems-mine refuse piles, subsidence, unreclaimed strip mines, junk cars, residential refuse dumps. Seventy-seven zones are rated by procedures developed by Rivkin/Carson, with Arthur Edwards Associates. Environmental improvement cost estimates for each zone are tabulated. Water pollution abatement is considered the most pressing need. Mine drainage pollution affects 22% of the 11,084 miles of the river, affecting all but minor areas of the basin. Inactive or abandoned mines cause most of this problem. Some progress has been made in abatement of pollution from active mines. An alternative order of priorities ranks only those zones with abandoned mine sites discharging at least 1,180 lbs/day of acid. Treatment of 154 of these sites would cost an estimated $5.8 million yearly for operation and maintenance and would not reduce the sulfate content of treated discharge. Zones furthest from the basin mouth are assigned highest priority since these affect the most stream miles. Increased local and federal funding is needed to complete secondary treatment facilities for some communities. EPA and the states have started to tackle the industrial waste pollution control problem. Enforcement of existing regulations and new legislation can aid in solving problems of erosion and siltation. Data is not now available for assessing the magnitude of problems of urban runoff and overflows. (Hufschmidt - North Carolina)
W76-08387

ROLE OF VITAMINS IN BACTERIAL-PLANKTON RELATIONSHIPS IN LITTORAL SEAWATER AND IN SUPRALITTORAL POOLS: II. ANNUAL EVOLUTION OF ORGANISMS WHICH PRODUCE VITAMIN SYNTHESIS, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
E. Vaceloet.
Cah Biol Mar. 16, p 383-394, 1975.

Descriptors: *Vitamins, *Microorganisms, *Bacteria, *Fungi, *Yeasts, Seasonal, Seawater, Inland waterways, Littoral, *Plankton, Growth rates, Populations, Aquatic populations.
Identifiers: Supralittoral pools, Rockpools.

Occurrence of vitamin-synthesizing organisms bacteria, fungi and yeasts in supralittoral rockpools and inshore waters was investigated. The seasonal changes of bacteria releasing vitamins are highly related to the heterotrophic microflora as a whole and especially to variations in the activity index of bacteria (i.e., to the growth rate of bacterial population). The annual changes of fungi and yeasts are, in part, opposite of those of the bacteria, but bacteria, fungi and yeasts seem to be enhanced by high temperatures and strong concentrations of organic matter.--Copyright 1976, Biological Abstracts, Inc.
W76-08405

CULTURE AND GROWTH OF NORTHERN ANCHOVY, ENGRAULIS MORDAX LARVAE,
National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
For primary bibliographic entry see Field 2L.
W76-08432

WEIGHT LOSS, MORTALITY, FEEDING, AND DURATION OF RESIDENCE OF ADULT AMERICAN SHAD, ALOSA SAPIDISSIMA IN FRESH WATER,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
M. E. Chittenden, Jr.
Fishery Bulletin, Vol. 74, No. 1, p 151-157, 1976. 1 fig, 41 ref.

Descriptors: *Freshwater fish, Weight, *Mortality, *Spawning, *Anadromous fish, *Commercial fish, Sport fish, Fish migration, Fish behavior, Reproduction, Fish reproduction, Size, Dimensions, Analytical techniques, Regression analysis, Food, Habits, Metabolism.
Identifiers: Alosa sapidissima, *American shad, Feeding behavior.

Linear regression equations are given for each sex for the regressions of total weight, somatic weight, and gonad weight on length prior to spawning, and for total weight on length after prolonged stay in fresh water. Most shad began to return seaward by late June and probably had spent a maximum of about 2 months in fresh water. Many fish, however, remained near the spawning grounds well into summer, and many died near the spawning grounds, probably from starvation. Opportunistic feeding occurred on 'planktonic' items, but adult shad do not regularly obtain energy sufficient to maintain their weight in fresh water. Weight loss was related to sex and increased with increasing size. Mean length males and females averaged 45 and 57% total weight loss, respectively. Daily somatic weight loss was at least 5.75 g for males of average size and 12.47 g for females. (Katz)
W76-08433

CHLORINATED HYDROCARBONS IN MESOPELAGIC FISHES OF THE EASTERN GULF OF MEXICO,
University of South Florida, St. Petersburg, Fla.
R. C. Baird, N. P. Thompson, T. L. Hopkins, and W. R. Weiss.
Bulletin of Marine Science, Vol. 25, No. 4, p 473-481, 1975. 2 tab, 41 ref.

Descriptors: Chlorinated hydrocarbon pesticides, *Absorption, *DDT, *Pesticide residues, *Polychlorinated biphenyls, *Dieldrin, *Gulf of Mexico, Zooplankton, Path of Pollutants, *Food webs, Fish, Deep water, Pesticides, Organic pesticides, Methodology, DDE, DDD, Chemical analysis.
Identifiers: Bioaccumulation, *Mesopelagic fishes, Deep water fishes, *Myctophidae, Gonostoma sp., Cyclothone sp.

Selected zooplankton collections and 1052 individuals representing 17 species of mesopelagic fishes from the eastern and northern Gulf of Mexico were analyzed for concentrations of DDT and its metabolites, dieldrin, and polychlorinated biphenyls (PCB's). DDT and its metabolites were found in small but measurable concentrations (generally less than 0.01 ppm) in all but a few samples. Dieldrin occurred more sporadically but when found, was generally in somewhat higher concentrations than DDT and metabolites. PCB's were ubiquitous and concentrations were usually one to two orders of magnitude higher than measured pesticide residues. PCB concentrations were as high or higher than that reported from midwater fishes from other areas, and measured organochlorine 'loads' were generally less than 1 ppm. No consistent geographic pattern was apparent. Diets varied considerably among species of fish as did organochlorine concentrations, although copepods were usually the principal forage. Nonmigrating species living at considerable depth appeared to concentrate organochlorines comparable to those which undergo diel vertical migration. The data tentatively suggest that dietary intake is an important organochlorine source for mesopelagic fishes and further imply a flow of energy out of the euphotic zone via oceanic food webs involving vertically migrating organisms. (Katz)
W76-08434

ABUNDANCE OF MACROCRUSTACEANS IN A NATURAL MARSH AND A MARSH ALTERED BY DREDGING, BULKHEADING, AND FILLING,
National Marine Fisheries Service, Galveston, Tex. Gulf Coastal Fisheries Center.
L. Trent, E. J. Pullen, and R. Proctor.
Fishery Bulletin, Vol. 74, No. 1, p 195-200, 1976. 3 tab, 2 fig, 16 ref.

Descriptors: Landfills, Bulkheads, *Marshes, *Eutrophication, Canals, Aquatic populations, *Crustaceans, Invertebrates, *Pink shrimp, Distribution, *Diurnal distribution, Diurnal, Construction, *Dissolved oxygen, Shrimp, Crabs, Migration, Aquatic habitats, Shallow water, Bodies of water, Distribution patterns, Environmental effects, Land reclamation, Land develop-

ment, Food webs, Seasonal, Estuaries, Water pollution effects.
Identifiers: *Brown shrimp, *White shrimp, Penaeus spp., Callinectes spp., *Blue crab.

Indices of abundance of macrocrustaceans were determined for day and night and statistically compared between a natural marsh area, upland and bayward canal areas of a housing development, and an open bay area. Differences were found in day-night distribution of brown shrimp (Penaeus aztecus), white shrimp (P. setiferus), blue crabs (Callinectes sapidus) and pink shrimp (P. duorarum). Migrations of all four species into the more shallow marsh areas at night explain these distributional differences. The generally lower catches of each species in the open bay and upland canal areas when compared with the marsh and bayward canal areas were attributed to permanent loss of intertidal vegetation in the housing development, low abundance of detrital material and benthic macroinvertebrates in the open bay and upland canal areas, and eutropic conditions in the upland canal area. (Katz)
W76-08435

DDT AND ITS METABOLITES IN THE SEDIMENTS OFF SOUTHERN CALIFORNIA,
National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
J. S. MacGregor.
Fishery Bulletin, Vol. 74, No. 1, p. 27-35, 1976. 8 fig., 4 tab., 6 ref.

Descriptors: *Sewage effluents, *DDT, *DDE, *DDD, *Chlorinated hydrocarbon pesticides, Water pollution sources, *Industrial wastes, *Metabolism, *Bottom sediments, *California, *Path of pollutants, Sampling, Pesticides, Aroclor, Chemical analysis, Bottom sampling, Water pollution effects, Methodology, Analytical techniques.
Identifiers: *Los Angeles County(Calif).

To asses the degree of DDT contamination in the marine sediments off Los Angeles, 103 stations in the Pacific Ocean off southern California were sampled in July and August 1971 for DDT and its metabolites, DDD and DDE. Heavy contamination of bottom sediments in this area was expected because of large amounts of DDT that have entered the ocean through the Los Angeles County sewer system as waste from a DDT manufacturing plant. From the data acquired, it was estimated that there were about 200 metric tons of DDT, DDD, and DDE in the sediments in an area of 14 square nautical miles near the sewer outfalls and 300 metric tons in the entire 911 square nautical mile area sampled. The heaviest concentrations of total DDT were distributed in the relatively shallow-water area on the Palos Verdes shelf to the northwest of the sewer outfalls in the general direction of the current flow. Metabolism of DDT was inhibited in deep-water sediments. Ratios of DDE to DDT were low, and DDT was more abundant than DDE at some stations. In sediments from shallow-water stations, DDE exceeded DDT by more than 10 times. (Katz)
W76-08436

EFFECTS OF TEMPERATURE AND SALINITY ON THE SURVIVAL OF WINTER FLOUNDER EMBRYOS,
National Marine Fisheries Service, Narragansett, R. I. Narragansett Lab.
C. A. Rogers.
Fishery Bulletin, Vol. 74, No. 1, p. 52-58, 1976. 4 fig., 6 tab., 20 ref.

Descriptors: *Fish reproduction, *Embryonic growth stage, *Fish eggs, *Temperature, *Salinity, Laboratory tests, Hatching, *Commercial fish, Sport fish, *Larval growth, Growth stages, Resistance, Pathology, Mortality, Osmosis, Spawning, Environmental effects, Water pollution effects.
Identifiers: Pseudopleuronectes americanus, *Winter flounder.

A series of experiments was performed to determine the optimum temperature and salinity for incubating winter flounder, Pseudopleuronectes americanus, embryos. Eggs in lots of 50 were subjected to a 0.5 to 45 ppt salinity range and a 3 to 14C temperature range in a total of 67 salinity-temperature combinations. Highest proportion of viable hatches occurred at 3C over a salinity range of 15 to 35 ppt. At temperatures above 3C, the optimal range was 15 to 25 ppt. Viable hatch decreased with increasing temperature. (Katz)
W76-08437

ELECTROPHYSIOLOGICAL STUDIES OF MORPHOLINE-IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH) AND RAINBOW TROUT (SALMO GAIRDNERI),
Wisconsin Univ., Madison. Lab. of Limnology.
J. C. Cooper, and A. D. Hasler.
Journal of the Fisheries Research Board of Canada. Vol. 33, p. 688-694, 1976. 1 fig., 2 tab., 17 ref.

Descriptors: Salmonids, *Rainbow trout, Anadromous fish, Fish behavior, Analytical techniques, Odor, Fish physiology, *Spawning, *Fish migration, Laboratory tests, *Lake Michigan, Bioassay, Fish reproduction, Life cycles, Smolt, Water pollution effects, Lakes.
Identifiers: *Electroencephalography, *Salmonid homing, *Coho Salmon, Imprintation, Olfactory hypothesis, Electrophysiology, Morpholine, Oncorhynchus Kisutch, Salmo gairdneri.

Two groups of coho salmon were exposed to a 5 x 10-5 mg/l concentration of a synthetic chemical, morpholine, for 4 weeks during the smolting period while two control groups were unexposed. All groups were marked and stocked into Lake Michigan. A second group of exposed and unexposed salmon was released 13 km from the first release location. Rainbow trout were tested in a similar experiment. Homing salmonids were censused and then used in physiological experiments. Electroencephalographic studies showed significantly greater responses by the exposed compared to control fish to 1% morpholine and by one paired group to a stream sample scented with morpholine (about 10-3 mg/liter). Responses to morpholine were specific in that another similar chemical did not elicit responses. These data support the olfactory hypothesis that salmon may imprint to naturally occurring homestream odors as they do to morpholine. (Katz)
W76-08438

EXPERIMENTAL CONFIRMATION OF THE OLFACTORY HYPOTHESIS WITH HOMING, ARTIFICIALLY IMPRINTED COHO SALMON (ONCORHYNCHUS KISUTCH),
Wisconsin Univ., Madison. Lab. of Limnology.
J. C. Cooper, A. T. Scholtz, R. M. Horrall, A. D. Hasler, and D. M. Madison.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 703-710, 1976. 2 fig., 3 tab., 27 ref.

Descriptors: *Spawning, *Fish migration, Fish behavior, *Salmonids, Odor, *Smolt, On-site investigations, On-site data collections, Fish reproduction, Anadromous fish, Life cycles, *Lake Michigan, Fish reproduction, Analytical techniques, Lakes, Water pollution effects.
Identifiers: *Olfactory hypothesis, *Coho salmon, Oncorhynchus kisutch, Imprintation, Morpholine.

To test the olfactory hypothesis of salmon homing, fingerling coho salmon were exposed to low concentrations of an odorous synthetic chemical, morpholine, during presmolt and smolting periods. The exposed fish were stocked into Lake Michigan with a control group. Another group of exposed and unexposed fish was released 13 km from the first group. During the adult spawning migration 18 months later, morpholine was dripped into the creek at the site of the first group release. In four experiments over 2 consecutive years the number of exposed fish captured at the artificially scented stream exceeded the number of unexposed fish by about 10 times, representing a highly significant difference. During the third year, morpholine was not added to the stream during the spawning migration and exposed and nonexposed fish returned in equal, low numbers. These results confirm the existence of odor imprinting and long-term olfactory memory in coho salmon. It is possible that this mechanism is also used in the natural imprinting situation. (Katz)
W76-08439

EFFECTS OF LOW CONCENTRATIONS OF OIL ACCOMMODATED IN SEA WATER ON THE GROWTH OF UNIALGAL MARINE PHYTOPLANKTON CULTURES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
N. J. Prouse, D. C. Bordon, Jr., and P. D. Keizer.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 810-818, 1976. 4 fig, 5 tab, 22 ref.

Descriptors: Oil, *Phytoplankton, *Growth rates, Sea water, *Water pollution effects, *Oil pollution, *Plant growth, *Algae, Marine microorganisms, Water pollution sources, Environmental effects, Laboratory tests, Inhibition, Primary productivity, Oil spills, Oily water, Analytical techniques, Gas chromatography, Spectroscopy.
Identifiers: *Growth stimulation.

Effects of three oils accommodated in sea water upon the growth of unialgal cultures of marine phytoplankton were investigated. The oil concentrations used covered the range normally encountered in sea water subjected to oil pollution (less than 1 mg/liter). In most experiments, minor stimulation or inhibition of growth occurred but in only two experiments was the growth of oil-contaminated cultures statistically different from controls (in both instances stimulation). Extrapolation of the results to the natural environment is complicated by several factors, the most important of which appear to be variability in organism response and the observation that oil concentration and composition change during experiments. Oil concentrations encountered in polluted sea water can affect the growth of phytoplankton, but the effects seem to be minor and short-lived. (Katz)
W76-08440

NOTE ON THE DISTRIBUTION OF MERCURY IN FISH SPECIES IN THREE OHIO LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
J. L. Aronson, M. Spiesman, and A. K. Aronson.
Environmental Pollution, Vol. 10, p. 1-7, 1976. 3 fig., 9 ref.

Descriptors: *Mercury, Fish, *Path of pollutants, *Food webs, *Carp, *Bioindicators, Metals, Water pollution effects, Sunfishes, Perches, Catfish, White Bass, Sediment, Adsorption, Lake Erie, *Ohio, Lakes, Distribution.
Identifiers: Pymatuning Lake(Ohio), Mosquito Lake(Ohio), Tissue analysis.

Mercury was measured for over a hundred fish (sunfish, perch, catfish, white bass and carp) from Fairport Harbour in Lake Erie and from Pymatuning Lake and Mosquito Lake, two large non-industrialized lakes near Lake Erie. All the taxa in the two lakes except carp contain the same low content of mercury, about 0.1 ppm. Carp are distinctly higher at about 0.25 ppm. At Fairport Harbour, carp also contain about 0.25 ppm mercury but, in contrast with the other two lakes this is not higher than the mercury of the other species, which also contain 0.25-0.35 ppm mercury. (Katz)
W76-08441

CHANGES IN BLOOD CHEMISTRY AND BLOOD CELL MORPHOLOGY IN COHO SALMON (ONCORHYNCHUS KISUTCH) FOLLOWING EXPOSURE TO SUBLETHAL LEVELS OF TOTAL RESIDUAL CHLORINE IN MUNICIPAL WASTEWATER,

Municipality of Metropolitan Seattle, Wash. Water Quality Lab.
J. A. Buckley, C. M. Whitmore, and R. I. Matsuda.

Journal of the Fisheries Research Board of Canada, Vol. 33, p. 776-782, 1976. 5 fig., 3 tab., 24 ref.

Descriptors: *Municipal wastes, *Chlorination, *Salmon, *Bioassay, *Pesticide residues, Fish physiology, Environmental effects, Chemical analysis, *Fish diseases, Water treatment, Chlorine, Sewage treatment, Salmonids, Waste water treatment, Laboratory tests, Toxicity, Toxicants, Water pollution sources, Water pollution effects.
Identifiers: *Sublethal effects, Oncorhynchus kisutch, *Blood chemistry, Erythrocytes, Anemia, Hemoglobin, *Coho salmon.

Yearling coho salmon were exposed for 12 weeks to either 0.3, 1.1 or 3.6% chlorinated municipal sewage treatment plant effluent with seawater diluent under continuous flow conditions. The maximum safe concentration of effluent lies between 0.3 and 1.1% (average total residual chlorine (TRC12) content 0.003 and 0.009 mg/liter respectively). Effluent concentrations of 0.3% produced no discernible effects on the fish. Concentrations of 1.1 and 3.6% (average content of TRC12 0.030 mg/liter) resulted in reductions of hemoglobin and hematocrit to levels indicative of anemia. Observations of the erythrocytes revealed lysed and degenerating cells, increased numbers of circulating immature cells, and abnormal cells. These hematological effects are attributed to the oxidative nature of the residual chlorine. (Katz)
W76-08442

SALINITY EFFECTS ON PLASMA ELECTROLYTES OF CHANNEL CATFISH, ICTALURUS PUNCTATUS,

Memphis State Univ., Tenn. Dept. of Biology; and Memphis State Univ., Tenn. Ecological Research Center.
K. B. Davis, and B. A. Simco.

Journal of the Fisheries Research Board of Canada, Vol. 33, pp. 741-746, 1976. 3 fig., 1 tab., 40 ref.

Descriptors: Salinity, *Channel catfish, Fish physiology, *Electrolytes, *Seasonal, *Temperature, Laboratory tests, Brackish water fish, Saline water, Sodium, Sodium chloride, Chlorides, Catfish, Freshwater fish, Osmosis, Water pollution effects.
Identifiers: *Plasma electrolytes, *Cortisol, Sublethal effects, *Salinity effects.

Plasma sodium and chloride levels of channel catfish increased after a 5-day exposure to 10 and 12 g/liter sodium chloride. Exposure of fish to 4 and 8 g/liter for 5 days resulted in plasma electrolyte levels higher than those of fish kept in aged tap water, but were not different from values usually found in freshwater fish. These differences may have been due to the handling. No seasonal effects were observed. When fish in July (27 C) were exposed to 10 g/liter sodium chloride, the plasma electrolyte concentration increased for 48 hours and then stabilized. Exposure to the same concentration in March (9 C) resulted in a slow increase of plasma electrolytes throughout the 13 days of the experiment. Injection of 100 micrograms/kg cortisol had no effect on plasma electrolyte increase during 48 hours after transfer to 12 g/liter sodium chloride. (Katz)
W76-08443

MORTALITIES AND EPIBIOTIC FOULING OF EGGS FROM WILD POPULATIONS OF THE DUNGENESS CRAB, CANCER MAGISTER,

California Univ., Davis. Dept. of Food Science and Technology.
W. S. Fisher, and D. E. Wickham.

Fishery Bulletin, Vol. 74, No. 1, p. 201-206, 1976 6 fig., 28 ref.

Descriptors: *Mortality, *Commercial shellfish, Fouling, *Crabs, *Hatching, *Immature growth stage, Aquatic algae, Nuisance algae, Cyanophyta, Crustaceans, Invertebrates, Sampling, Microscopy, Bays, *California, Shellfish farming, Water pollution effects.
Identifiers: Cancer magister, *Epibiotic fouling, *San Francisco Bay, *Crab eggs.

Observations of fouling and mortality in the natural population of Dungeness Crab, Cancer magister, suggested an explanation for the decline in Dungeness crab catches from the San Francisco Bay region. A distributional study compared mortalities and epibiotic fouling of crab eggs from various locations along the coast of Northern California. Epibiotic fouling organisms were found to be long filamentous cyanophytes and bacterial filaments. Worms were found, too. A relationship between fouling and egg mortality was tentatively established. Other factors contributing to the decline in the crab population in the San Francisco area are shifting currents, rainfall, and upwelling intensity. Since the fouling organisms are saprophytic, external factors causing epibiotic fouling may originate in San Francisco Bay effluent. (Katz)
W76-08444

OPTICAL MALFORMATIONS INDUCED BY INSECTICIDES IN EMBRYOS OF THE ATLANTIC SILVERSIDES, MENIDIA MENIDIA,

Rutgers - The State Univ., New Brunswick, N. J. Dept. of Zoology; and Rutgers - The State Univ., New Brunswick, N. J. Dept. of Physiology.
J. S. Weiss, and P. Weiss.

Fishery Bulletin, Vol. 74, No. 1, p. 208-211, 1976. 1 tab., 1 fig., 17 ref.

Descriptors: *Embryonic growth stage, *DDT, *Toxicants, *Fish diseases, *Toxicity, *Pesticides, Water pollution effects, Hatching, Fish eggs, *Silversides, Reproduction, Laboratory tests, Environmental effects, Mortality, *Fish reproduction, Insecticide, Chlorinated hydrocarbon pesticides, Insecticides.
Identifiers: *Sevin, *Malathion, *Menidia menidia.

Tests with DDT, malathion and sevin were performed to determine the effects of these pesticides on the development of Menidia menidia eggs in the laboratory. Eggs at a cleavage stage of about 100 cells, late cleavage, were treated with malathion of 10 and 100 ppb and sevin at 25 and 100 ppb. Percents of successful axis formation and heartbeat initiation were lower than controls, while hatching time was not affected. Eggs at the 2-4 cell stage were exposed to DDT at 25 and 100 ppb and to malathion at 10 and 100 ppb and similar results were found. Optic malformations were observed in embryos exposed to DDT, malathion and sevin. Skeletal malformations were also noted in some cases. (Katz)
W76-08445

THE PLANKTON TOWER. I. A STRUCTURE TO STUDY WATER/SEDIMENT INTERACTIONS IN ENCLOSED WATER COLUMNS,

Kiel Univ. (West Germany). Institut fuer Meereskunde.
B. Von Bodungen, K. Von Brockel, V. Smetacek, and B. Zeitschel.

Marine Biology, Vol. 34, p 369-372, 1976. 2 fig, 7 ref.

Descriptors: *Bottom sediments, *Analytical techniques, Structures, Technology, Equipment, Research equipment, *Sea water, Aquatic environment, Design, *Towers, Columns.
Identifiers: *Plankton tower, *Kiel Bight(Germany).

A brief description and schematic drawing is given of the plankton tower. It consists of a steel structure 16.5 m high, standing at a depth of 11 m. Four cylindrical plastic enclosures, each with a volume of about 30 cubic meters, are suspended in the tower. A column of water, from the surface to the bottom including sediments, is contained within each of these. Results from the first experiment show that this method is suitable for investigations concerned with the study of interactions between the water column and the sediments. (See also W76-08447) (Katz)
W76-08446

THE PLANKTON TOWER. II. RELEASE OF NUTRIENTS FROM SEDIMENTS DUE TO CHANGES IN THE DENSITY OF BOTTOM WATER,

Kiel Univ. (West Germany). Institut fuer Meereskunde.
V. Smetacek, B. vonBodungen, K. vonBrockel, and B. Zeitschel.

Marine Biology, Vol. 34, p 373-378, 1976. 1 tab, 3 fig, 15 ref.

Descriptors: Density, Discharge(Water), On-site investigations, *Benthos, *Bottom sediments, *Salinity, *Nutrients, Connate water, Saline water, Pore water, Hypolimnion, Cycling nutrients, Water properties, Dissolved oxygen, Interstices, Sediments.
Identifiers: *Plankton tower, Nutrient discharge.

A water column of about 30 cubic meters extending from the surface to the bottom over a 3 square meter patch of sediment (coarse sand), was isolated and observed over a period of 33 days. Water exchange took place with the surroundings because of near-surface openings that appeared in the enclosure, and also because of density changes due to salinity fluctuations in the surrounding water. Denser water entered the enclosure through the sediments, displacing the lighter water through the near-surface openings. Very high nutrient and low oxygen values were measured in the bottom water following this water influx. It is postulated that interstitial water is flushed out of coarse-grained sediments by gravity displacement due to changes in the density of bottom water. In certain areas this mechanism of nutrient release from the sediments is presumably of great ecological importance for the phytoplankton and benthos. (See also W76-08446) (Katz)
W76-08447

THE TOXICITY OF VARIOUS MINING FLOTATION REAGENTS TO RAINBOW TROUT (SALMO GAIRDNERI),

Sir George Williams Univ., Montreal (Quebec). Dept. of Biological Sciences; and Sir George Williams Univ., Montreal (Quebec). Water Pollution Research Lab.
M. Webb, H. Ruber, and G. Leduc.

Water Research, Vol. 10, p 303-306, 1976. 3 tab, 4 ref.

Descriptors: *Bioassay, *Rainbow trout, *Mine wastes, *Flotation, *Froth flotation, *Toxicity, *Lethal limit, Laboratory tests. Water treatment, Methodology, Water pollution sources, Toxicants, Water quality control, Water pollution effects, Bioindicators.
Identifiers: Flow-through bioassay, Static bioassay, Frothers, *Xanthates, Flotation reagents, Potassium ethyl xanthate, Sodium isopropyl xanthate, Sodium ethyl xanthate, Potassium amyl xanthate, Xylenol, Polypropylene glycol.

Preliminary testing of eight collectors (xanthates) and four frothers in 96-h static and 28-day flow-through bioassays using rainbow trout as the test organism show a great disparity in the toxicity of the chemicals administered in these two ways. For the short-term tests, the relative toxicity of the compounds is expressed as an LC-50 or as a range of concentrations in mg/l in which the LC-50 is expected to fall. Sodium ethyl and potassium amyl xanthate were the most toxic collectors tested in this way with LC-50's in the range of 30-50 mg/l. Among the frothers, xylenol (cresylic acid) was the most toxic (5.6 mg/l greater than LC-50 greater than 3.2 mg/l) while polypropylene glycol was least toxic (LC-50 greater than 1000 mg/l). In long-term flow-through tests using potassium ethyl, sodium isopropyl, sodium ethyl, and potassium amyl xanthate, the toxicity of the chemicals was on the order of 100 times greater than in the static bioassay results. (Katz)
W76-08448

PASSAGE OF METALS IN EFFLUENTS, THROUGH BACTERIA TO HIGHER ORGANISMS,
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-08449

THE ACUTE TOXICITY OF DISSOLVED ELEMENTAL PHOSPHORUS TO COD (GADUS MORHUA),
Imperial Chemical Industries Ltd., Bixham (England). Brixham Research Lab.
B. G. Maddock, and D. Taylor.
Water Research, Vol. 10, p 289-294, 1976. 3 fig, 2 tab, 12 ref.

Descriptors: Aqueous solutions, *Toxicity, Laboratory equipment, *Lethal limit, Laboratory tests, *Phosphorus, Analytical techniques, *Bioassay, *Absorption, Water quality, *Toxicants, Gas chromatography, Methodology, Water pollution effects.
Identifiers: Gadus morhua, *Cod, Bioaccumulation, Tissue analysis.

The effect of elemental phosphorus in true solution on cod (Gadus morhua) was tested in a laboratory experiment designed to eliminate the influence of a colloidal suspension. The 48 hr LC 50 for dissolved elemental phosphorus is 14.4 micrograms per liter. The incipient lethal level is estimated at 1-2 micrograms per liter. Elemental phosphorus was rapidly assimilated into the body tissues with a homogeneous distribution of phosphorus in the muscle tissue at 10-30 times the exposure level. Livers contained the highest concentrations of phosphorus. When exposure is ended, the biological half-life of accumulated phosphorus appears to be very short. (Katz)
W76-08450

THE EFFECT OF HEAVY METALS ON LABORATORY POPULATIONS OF TWO POLYCHAETES WITH COMPARISONS TO THE WATER QUALITY CONDITIONS AND STANDARDS IN SOUTHERN CALIFORNIA MARINE WATERS,
California State Univ., Long Beach.
D. J. Reish, J. M. Martin, F. M. Piltz, and J. Q. Word.
Water Research, Vol. 10, p 299-302, 1976. 3 tab, 12 ref.

Descriptors: *Bioassay, *Heavy metals, Water quality, *Toxicity, Water pollution sources, Water pollution effects, *Lethal limit, Laboratory tests, *Annelids, Larvae, Cadmium, Copper, Lead, Mercury, Zinc, Chromium, Municipal wastes, Sewage effluents, *Growth stages, Water quality standards, Benthic fauna, Environmental effect, Water quality control.
Identifiers: *Neanthes sp., *Capitella sp., Polychaetes.

Polychaetous annelid assays were performed with laboratory inbred cultures of juvenile an adult Neanthes arenaceodentata an Capitella capitata to cadmium, chromium, copper, lead, mercury, and zinc in sea water. Data werepresented as 96-h and 28-day LC-50 concentrations. Mercury and copper were the two most toxic with zinc and chromium generally the next most toxic followed by lead and cadmium. The adult stages of both species were more tolerant to these metals than the juveniles. Comparisons of these six metals present in the two large domestic sewage outfalls in Los Angeles County indicate that the amount of copper and zinc present in the effluent exceeds the 28-day LC-50 of these two polychaetes. The results were compared to the water quality standards for discharges in the State of California. (Katz)
W76-08451

UPTAKE AND ACCUMULATION OF COPPER AND NICKEL BY METAL TOLERANT STRAINS OF SCENEDESMUS,
P. Stokes.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2128-2137, 1975, 6 tab, 4 fig, 13 ref.

Descriptors: Copper, Nickel, *Algae, Plant populations, Plant physiology, *Mine wastes, Mining, *Scenedesmus, Plant growth regulators, Water quality control, Methodology, *Toxicity, Permeability, Canada, *Absorption, Water pollution effects.
Identifiers: *Sudbury(Ontario), *Bio-accumulation, *Copper uptake rate, *Nickel uptake rate, Prolonged uptake.

The toxicity of copper and nickel to algae isolated from a lake in mining-smelting areas of Sudbury, Ontario, are tested in the laboratory. Copper and nickel are taken up by the algae. The uptake and toxicity of nickel in the presence of copper supports the theory that copper increases the permeability of the cell. (Katz)
W76-08452

EFFECT OF CRUDE OIL ON POPULATIONS OF BACTERIA AND ALGAE IN ARTIFICIAL PONDS SUBJECT TO WINTER WEATHER AND ICE FORMATION,
D. B. Shindler, B. F. Scott, and D. B. Carlisle.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2138-2144, Stuttgart, November 1975. 2 tab, 6 fig, 12 ref.

Descriptors: *Oil pollution, Oil spills, *Algae, Aquatic microorganisms, *Azotobacter, Oil water interface, Water pollution effects, Environmental effects, Food web, Aquatic environment, Methodology, *Bacteria, Canada, *Oil wastes, Ponds, Eutrophication.
Identifiers: Normal wells crude oil, *Heterotrophic bacteria, Flavobacterium, Vibrio, Acinetobacter, Arthrobacter, Caulobacter.

Field and experimental studies in Ottawa, Canada, under winter ice conditions indicated that oil added to water greatly affected microorganisms present. After oil from a spill enters the lake waters an initial selection of one or a few bacterial types takes place, followed by a development of greater diversity. The initial bacteria are similar or closely related to types reported to degrade crude oil. Ponds remained aerobic the following summer and supported strictly aerobic bacteria such as Azobacter. Bacterial populations indicated an accelerated rate of eutrophication. (Katz)
W76-08453

HEAVY METAL TOXICITY AND SYNERGISM TO FLOATING AQUATIC WEEDS,
T. C. Hutchinson,, and H. Czyrska.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2102-2111, 1975. 3 fig, 8 tab, 6 ref.

Descriptors: Cadmium, Zinc, Silver, Copper, Nickel, *Phytotoxicity, Methodology, *Aquatic vegetation, Floating plants, *Heavy metals, *Absorption, Water pollution effects.
Identifiers: *Lemna minor, *Salvinia natans, Competitive effects, Cadmium-Zinc interaction, *Common duckweed, *Metal accumulation.

Lemna and Salvinia were grown in solutions of cadmium, zinc, silver, copper and nickel. A significant concentration effect was seen for all metals analyzed comparing water concentrations with plant levels. Data indicated the extent to which high metal accumulation can occur in duckweed and emphasize the potential hazards of increased metal discharges into water bodies. The magnification found for such toxic metals as copper, cadmium and lead was often greater than 1000 times, even at the low, non-toxic levels found in the lakes. (Katz)
W76-08454

DOES COPPER CAUSE ANEMIA IN BIOMPHALARIA GLABRATA,
Lehigh Univ., Bethlehem, Pa. Inst. for Pathology; and Lehigh Univ., Bethlehem, Pa. Center for Health Sciences.
T. C. Cheng.
Journal of Invertebrate Pathology, Vol. 26, p 421-422, 1975.

Descriptors: *Snails, *Gastropods, *Copper sulfate, *Toxicants, Copper, *Mode of action, *Pesticides, Laboratory tests, Analytical techniques, Molluscicides, Animal physiology, Water pollution effects.
Identifiers: *Biomphalaria glabrata, *Anemia.

To test the hypothesis that copper kills Biomphalaria glabrata by destroying the hemoglobin-synthesizing cells, snails were exposed to either 60 / 0.06 ppm CuS04 for 12 or 72 hours. Serum was analyzed for hemoglobin content and no significant differences were found between test animals and controls. The cidal effect of copper on this gastropod is as yet unknown. (Katz)
W76-08455

THE INFLUENCE OF WATER QUALITY ON ACCUMULATION OF HEAVY METALS IN AQUATIC ORGANISMS,
L. Karbe, N. Antonacopoulos, and C. Shnier.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie. Vol. 19, p 2094-2101, 1975. 6 fig, 10 ref.

Descriptors: Water quality, *Heavy metals, Mercury, Cobalt, Chromium, Zinc, *Molluscs, Pelycepods, Gastropods, *Dissolved oxygen, *Absorption, Water pollution effects, Trophic levels, Mussels.
Identifiers: Dreissena polymorpha, Unio tanidus, Anodonta anatina, Schaalser, Elbe River, Hamburg Harbor, *Saprobity.

Results of study support hypothesis that the accumulation of metals by organisms is strongly influenced by the trophic and saprobic condition of the water. Regional differences in mortality of organisms were observed. Studies demonstrate that water quality definitely influences heavy metal concentration by aquatic organisms. (Katz)
W76-08456

SURVIVAL RATE OF STARVING CARP (CYPRINUS CARPIO LINNE), (IN RUSSIAN),
Tsentralnyi Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Baku (USSR). Azerbaijan Branch.
T. A. Askerov.
Gidrobiol Zh. 11(1), p 102-103, 1975.

Descriptors: Fish, *Carp, *Fish hatcheries, *Mortality, Fishkill.

Identifiers: *Starvation(Fish).

In connection with the hatchery breeding of Cyprinus carpio the effect of starvation on the survival rate of larvae was investigated. The absence of food in the mixed (endogenous-exogenous) feeding stage delays resorption of the yolk and leads to underdevelopment of the digestive organs and to death on the 8-9th day after the start of mixed feeding.--Copyright 1976, Biological Abstracts, Inc.
W76-08552

PHYTOPLANKTON IN NORTHERN DONETSK PONDS FOR ADDITIONAL TREATMENT, (IN UKRANIAN),
Dnepropetrovskii Gosudarstvennyi Universitet (USSR). Inst. of Hydrobiology; and Dnepropetrovskii Gosudarstvennyi Universitet (USSR).
Z. S. Haukhman, A. S. Kyrylenko, and F. P. Ryabov.
Ukr Bot Zh. 32(1), p 100-102, 1975. (Engl. summ.).

Descriptors: *Ponds, *Phytoplankton, *Biomass, Chemical wastes, *Waste water treatment, Effluents.
Identifiers: Chlorophyceae, Diatomaceae, Donetsk, Euglenophyta, USSR.

Composition, numbers and phytoplankton biomass in ponds for additional waste treatment of chemical industry effluents in northern Donetsk (USSR) are discussed. As waste passed through the ponds the number of species, quantitative vegetation and total biomass of phytoplankton increased, the specific value of Diatomaceae decreased and that of Chlorophyceae and Euglenophyta rose, indicating a considerable role of the latter in the additional treatment process.--Copyright 1976, Biological Abstracts, Inc.
W76-08577

BACTERIAL CONTAMINATION OF PERENNIAL GRASSES IN OVERHEAD IRRIGATION WITH SEWAGE, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny, Vilnius (USSR).
For primary bibliographic entry see Field 5D.
W76-08582

CHEMISTRY AND EFFECTS OF CHLORINE IN AQUATIC SYSTEMS, A SELECTED, ANNOTATED BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn. Ecological Sciences Information Center.
J. S. Mattice, H. A. Pfuderer, and B. N. Collier.
Available from the National Technical Information Service, Springfield, Va 22161, as ORNL/EIS-82, $4.50 in paper copy, $2.25 in microfiche. ORNL/EIS-82, Environmental Sciences Division Publication No. 808, 69 p. March 1976. W-7405-eng-26.

Descriptors: *Bibliography, *Chlorine, *Aquatic environment, Chemistry, Environmental effects, Pollutant identification, Water pollution effects.

This bibliography contains 191 references which are arranged alphabetically by first author within the subject categories. Indexes provided are: author, keywords, scientific names of test organisms, geographic location of field research, and title. This is the first bibliography published from an information file on the chemistry and effects of chlorine in aquatic systems. Special efforts were made to record chlorine residuals, the systems in which the chlorine was assayed, methods of chlorine determination and physical conditions under which the experiments were run. (Chilton-ORNL)
W76-08592

SAVANNAH RIVER BIOLOGICAL SURVEY, LOWER THREE RUNS.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
Available from the National Technical Information Service, Springfield, Va 22161 as TID-26675, $4.50 in paper copy, $2.25 in microfiche. September-October 1962 for E. I. duPont de Nemours and Co., TID-26675, (1963), 58 p, 4 fig, 8 tab, append.

Descriptors: *Surveys, *Baseline studies, *Aquatic life, Environment, Populations, Insects, Algae, *South Carolina, Rivers, Pollutant identification.
Identifiers: Species diversity, *Savannah River(SC), Lower Three Runs.

The purpose of this survey conducted in September and October of 1962, was to determine whether any physical, chemical, or biological changes had occurred at the Millet-Martin Station on Lower Three Runs, a tributary of the Savannah River, since the last survey there in September, 1961. Evidence of damage was found to the insect fauna particularly in species diversity and population densities. An abundant food supply for the lower invertebrates indicated that the restrictions must have been due to some source other than food. A considerable increase in species diversity of protozoa indicated that some of the restricting influence may not now be acting. A 50% composite count for some algae indicated considerable organic enrichment. (Chilton-ORNL)
W76-08593

SAVANNAH RIVER BIOLOGICAL SURVEY.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
Available from the National Technical Information Service, Springfield, Va 22161, as TIP-26673, $7.75 in paper copy, $2.25 in microfiche. August-September 1955, May 1956 for E. I. duPont deNemours & Co., TID-26673, March, 1957. 210 p, 17 fig, 39 tab, 21 ref, 3 append.

Descriptors: *Surveys, *Baseline studies, *Aquatic life, Environment, Populations, *South Carolina, Pollutant identification.
Identifiers: *Savannah River(SC), Upper Three Runs.

Two series of studies were made in the vicinity of the Savannah River Plant for the purpose of determining whether or not any change had occurred in the aquatic life and general environmental factors in the Savannah River since the surveys of 1951-1952. The results of the studies indicate a considerable improvement in the aquatic life compared with the results of the summer survey of 1951 and the spring survey of 1952. The only group of organisms which seemed to be in poorer condition than at the time of the base line studies was the clams. Studies conducted on Upper Three Runs, a tributary of the Savannah River, indicated that the fauna and flora of the tributary were not in quite as good condition in 1955 as in 1951 with the change being most evident in the size of populations and to some extent in the number of species of algae, protozoa, and fish. However, in the spring of 1956 the fish were the only group showing a significant change. (Chilton-ORNL)
W76-08594

SAVANNAH RIVER LABORATORY ENVIRONMENTAL TRANSPORT AND EFFECTS RESEARCH ANNUAL REPORT - 1974.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W76-08596

TRANSURANIUM NUCLIDES IN THE ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
Available as STI/PUB/410 from UNI PUB, New York, N. Y. Proceedings of a sympoium held in San Francisco on November 17-21, 1975. IAEA, Vienna, Austria, 1976, 726 p.

Descriptors: *Conferences, *Radioisotopes, *Environmental effects, Publications, International commissions.

These proceedings include the full texts of 41 papers, the discussions on them and the panel presentations which were presented at the symposium. The symposium was sponsored by the United States Energy Research and Development Administration and the International Atomic Energy Agency. The subjects of the sessions include ecological studies; effluents and marine studies; geohydrologic studies; biological uptake and transfer; pathways to man; environmental monitoring; health effects, risks and standards; and evaluation of environmental materials. The subject of the panel discussion was Plutonium-Implications for Man and His Environment. (See W76-08598 thru W76-08607) (Chilton-ORNL)
W76-08597

STUDY OF THE BEHAVIOUR OF TRANSURANICS AND POSSIBLE CHEMICAL HOMOLOGUES IN LAKE MICHIGAN WATER AND BIOTA,
Argonne National Lab. Ill.
M. A. Wahlgren, J. J. Alberts, D. M. Nelson, and K. A. Orlandini.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held at San Francisco, November 17-21, 1975. p 9-24, 5 fig, 2 tab, 29 ref.

Descriptors: *Chemistry, *Plutonium, *Americium, *Uranium, Freshwater, Aquatic life, *Lake Michigan.

The mean concentration factors observed for Pu 239, 240, Am 241, and U 238 in Lake Michigan biota are presented and these values are compared to those of trace elements that have short residence times in Lake Michigan. Comparison of the concentraion factors indicates that the relative decreasing order of uptake of the three radionuclides in the freshwater food-chain is Am, Pu, and U. Evidence is presented that indicates a tetravalent oxidation state is likely as the dominant chemical form of fall-out plutonium in Lake Michigan. The time-dependence of the concentration of fall-out Pu 239, 240 in Lake Michigan can be described qualitively in terms of a simple mass-action model. (See also W76-08597) (Chilton-ORNL)
W76-08598

PLUTONIUM IN THE AQUATIC ENVIRONMENT, ITS BEHAVIOUR, DISTRIBUTION AND SIGNIFICANCE,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
K. C. Pillai, and E. Mathew.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 25-45, 12 tab, 1 fig, 25 ref.

Descriptors: *Environmental effects, *Plutonium, *Radioisotopes, *Aquatic environment, Sediments, Sea water, Benthos, Silts.
Identifiers: *Bombay Harbor Bay(India).

The behaviour and distribution of plutonium in seawater, silt, sediments, organisms and solar salt of Bombay Habour Bay were investigated. The suspended silts and bottom sediments were found to have a high capacity for removal of plutonium from seawater with nearly 99% of the plutonium being removed in this way. The maximum accumulation of Pu 239 was observed in benthic organ-

isms, particularly in arca flesh. The interaction of plutonium solutions and trace plutonium and the formation of both ionic and non-ionic species of plutonium were studied. Organic matter added to seawater inhibited hydrolysis and precipitation of added Pu. The anionic species increased with time. Plutonium was present in the purified organic fraction of material extracted from coastal sediments. (See also W76-08597) (Chilton-ORNL)
W76-08599

PLUTONIUM IN ATLANTIC COASTAL ESTUARIES IN THE SOUTHEASTERN UNITED STATES OF AMERICA,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
D. W. Hayes, J. H. LeRoy, and F. A. Cross.
In: Transuranium Nuclides in the Environment, Proceedins of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 79-88, 4 fig, 2 tab, 15 ref.

Descriptors: *Environmental effects, *Aquatic environment, *Plutonium, Estuaries, Nuclear powerplants, Atlantic Ocean, Southeast U.S.

Estuaries of the Savannah, Neuse, and Newport rivers and one tidal marsh were surveyed to determine the plutonium concentration in sediments, biota and suspended particulate matter. Of the three estuaries, only the Savannah River estuary has a nuclear installation upstream. The Savannah River estuary has received in addition to fall-out plutonium, up to 0.3 Ci of plutonium from the Savannah River Plant. In general, plutonium concentrations in the various environmental components of the Savannah River estuary were not higher than reported values for other coastal marine areas. (See also W76-08597) (Chilton-ORNL)
W76-08600

THE PLUTONIUM CONTENT OF PACIFIC OCEAN WATERS,
Geochemistry Research Association, Tokyo (Japan).
Y. Miyake, and Y. Sugimura.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 91-105, 4 fig, 8 tab, 23 ref.

Descriptors: *Plutonium, *Sea water, *Pacific Ocean, Surface waters, Deep water.

48 samples were collected across a wide area of the Pacific Ocean for the determination of the plutonium isotope contents and the Pu 238 to Pu 239, 240 isotopic ratio in the surface layer. In the North Pacific 0.00022 to 0.00094 pCi/l of Pu 239, 240 were observed in the surface waters. In the South Pacific the plutonium content ranged from 0.00013 to 0.00034 pCi/l. The ratio of Pu 238/Pu239, 240 in surface waters ranged from 0.1 to 0.81 in the North Pacific and 0.35 to 2.4 in the South Pacific. Higher ratios were observed in the deeper layer. (See also W76-08597) (Chilton-ORNL)
W76-08601

DISTRIBUTIONS OF TRANSURANIUM NUCLIDES IN SEDIMENT AND BIOTA OF THE NORTH ATLANTIC OCEAN,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W76-08602

COMPARISON OF THE DISTRIBUTIONS IN MARINE SEDIMENTS OF THE FALLOUT DERIVED NUCLIDES FE 55 AND PU 239,240, A NEW APPROACH TO THE CHEMISTRY OF ENVIRONMENTAL RADIONUCLIDES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W76-08603

ENVIRONMENTAL AND PUBLIC HEALTH CONSEQUENCES OF THE CONTROLLED DISPOSAL OF TRANSURANIC ELEMENTS TO THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. A. Hetherington, D. F. Jefferies, N. T. Mitchell, R. J. Penteath, and D. S. Woodhead.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, november 17-21, 1975. p 139-154, 9 tab, 10 ref.

Descriptors: *Environmental effects, *Public health, *Sea water, Plutonium, Americium, Biota, Radioisotopes, Sediments.

The paper reviews the radiological significance of plutonium and americium discharges to the marine environment in terms of dose to man and to environmental resources. From the public health viewpoint there appears to be a substantial margin of safety within the present authorization and for the aquatic organism considered the hazard does not seem to be of any great significance. The major part of the plutonium and americium appears to be removed from the general water circulation soon after discharge and becomes associated with the sediment phase forming a reservoir of these nuclides. There has been no measurable remobilization of the radioactivity within stable sedimentary deposits over periods of up to 20 years. However, more should be learned about the bond between these nuclides and the sediments in order to demonstrate the total safety of these discharges over periods dictated by the half-life of Pu 239. (See also W76-08597) (Chilton-ORNL)
W76-08604

INTERACTION OF PLUTONIUM WITH COMPLEXING SUBSTANCES IN SOILS AND NATURAL WATERS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W76-08605

PLUTONIUM AND AMERICIUM IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Ill.
D. N. Edington, J. J. Alberts, M. A. Wahlgren, J. Karttumen, and C. A. Reeve.
In: Transuranium Nuclides in the Environment, Proceedings of a symposium on Transuranium Nuclides in the Environment held in San Francisco, November 17-21, 1975. p 493-516, 4 tab, 4 fig, 22 ref.

Descriptors: *Radioactivity, *Plutonium, *Americium, Sediments, *Lake Michigan, Sedimentation rates.

The vertical distribution of Pu 239, 240 and Cs 137 was determined in 15 sediment cores. These sediments showed a total deposition of Pu 239, 240 ranging from 0.02 to 0.43 pCi/sq cm and, in areas of high sedimentation, a maximum concentration corresponding to the maximum atmospheric input during 1963. Comparison of Pu 239, 240 and Cs 137 deposition indicated that these isotopes are being removed by the same mechanism, with greatest deposition in areas of highest sedimentation rates. The Pu 238/ Pu 239, 240 ratio in selected cores exhibited ratios in the range 0.03 to 0.04. The possible chemical mobility of Pu 239, 240 was determined by examination of grab samples. Most of the plutonium wasassociated with the hydrous oxides of iron and manganese. Less than 7% of the total Pu 239, 240 was associated with the sedimentary humic and fulvic acid fractions. Studies showed that Am 241 is being formed in situ and shows little or no preferential mobility over Pu 239, 240. (See also W76-08597) (Chilton-ORNL)
W76-08606

PLUTONIUM RADIONUCLIDES IN THE GROUNDWATERS AT ENEWETAK ATOLL,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W76-08607

DETERMINATION OF PLUTONIUM IN THE MARINE ENVIRONMENT,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5A.
W76-08615

RADIORUTHENIUM IN COASTAL WATERS,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5A.
W76-08619

A REVIEW OF METHODS FOR THE DETERMINATION OF RADIOACTIVE AND STABLE ZIRCONIUM IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W76-08620

A REVIEW OF METHODS FOR THE DETERMINATION OF RADIOACTIVE AND STABLE SILVER IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W76-08621

A REVIEW OF METHODS FOR THE DETERMINATION OF IODINE-131 IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W76-08622

A RAPID METHOD FOR THE DETERMINATION OF RADIOIODINE IN SUSPENDED MATTER AND SEAWATER,
Central Lab. for Radiological Protection, Warsaw (Poland).
For primary bibliographic entry see Field 5A.
W76-08623

A METHOD FOR THE RAPID ENRICHMENT AND DETERMINATION OF SILVER-110M AND IODINE-131 FROM SEAWATER,
Deutsches Hydrographisches Institut, Hamburg (West Germany).
For primary bibliographic entry see Field 5A.
W76-08624

A STUDY OF THE STABILITY OF SOME RADIONUCLIDES IN SEAWATER,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W76-08625

INTERCALIBRATION OF METHODS FOR RADIONUCLIDE MEASUREMENTS ON A SEAWEED SAMPLE,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.

For primary bibliographic entry see Field 5A.
W76-08626

RADIOACTIVITY IN THE HYDROSPHERE RECENT TRENDS IN CZECH STUDIES,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W76-08627

ENTRAINMENT AND INTAKE SCREENING, PROCEEDINGS OF THE SECOND ENTRAINMENT AND INTAKE SCREENING WORKSHOP.
Electric Power Research Inst., Palo Alto, Calif.
For primary bibliographic entry see Field 8I.
W76-08628

EVALUATION OF ENTRAINMENT EFFECT,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 8I.
W76-08629

ZOOPLANKTON SURVIVAL IN COOLING WATER SYSTEMS OF FOUR THERMAL POWER PLANTS ON THE CALIFORNIA COAST-INTERIM REPORT. MARCH 1971-JANUARY 1972,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
J. W. Icanberry, and J. R. Adams.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University in Baltimore, Maryland, February 5-9, 1973. p 13-22, 11 tab, 5 fig, 8 ref.

Descriptors: *Cooling water, *Zooplankton, *Mortality, Entrainment, California, Nuclear powerplants.
Identifiers: Humboldt Bay Power Plant, Moss Landing Power Plant, Morro Bay Power Plant, Potrero Po Power Plant.

A definite linear relationship was found to exist between the discharge temperature and percentage of mortality difference as shown by regression analysis. The average mortality difference for Humboldt Bay Power Plant was 5.89%; for Moss Landing Power Plant, 10.68%; for Morro Bay Power Plant, 6.74%; for Potrero Power Plant, 1.31%. A filter-pump system was responsible for reducing intake and discharge sampling mortalities, thus providing a more accurate estimate of zooplankton mortality after passage through power plant cooling water systems. The adult copepod group was most abundant in the samples and experienced the highest overall mortality with soft-bodied forms being least abundant and incurring the lowest mortality. (See also W76-08628) (Chilton-ORNL)
W76-08630

ENTRAINMENT AND THERMAL EFFECTS ON A MYSID SHRIMP AND STRIPED BASS IN THE SACRAMENTO-SAN JOAQUIN DELTA,
California State Dept. of Fish and Game, Stockton. Delta Fish and Wildlife Study.
H. K. Chadwick.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, on February 5-9, 1973. p 23-30, 9 fig, 5 tab, 9 ref.

Descriptors: *Thermal pollution, *Environmental effects, Striped bass, Shrimp, Thermal stress, Entrainment, Nuclear powerplants.
Identifiers: Neomysis.

The report evaluates the effect of thermal discharges in terms of short-term temperature shock and long-term exposure to elevated temperatures on the species studied. In the thermal shock studies plant operations were simulated. Organisms coming into the plant were exposed to maximum temperatures (a maximum temperature rise of 10 degrees C at full plant capacity) for about 5 min. after reaching the condensers and then to a rapid decay to ambient temperatures after about 30 min in the river. The chief requirement for minimizing losses of striped bass and Neomysis appeared to be keeping the maximum temperature below 30 degrees C. It was generally concluded that striped bass passing through or near power plants have an exposure of something on the order of 30 min maximum and that the principal concern is with exposure to thermal shock and not to long-term exposure to elevated temperatures. (See also W76-08628) (Chilton-ORNL)
W76-08631

SUMMARY OF ENTRAINMENT RESEARCH AT THE MILLSTONE POINT NUCLEAR POWER STATION, 1970 TO 1972,
Woods Hole Oceanographic Institution, Mass.
E. J. Carpenter, B. B. Peck, and S. J. Anderson.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 31-35, 3 fig, 1 tab, 20 ref.

Descriptors: *Entrainment, *Thermal pollution, Mortality, Phytoplankton, Copepods, Primary productivity, Chlorination.

The effects of power plant entrainment on copepods and phytoplankton was studied. About 70% of the copepods entering the power plant were not returned to Long Island Sound. This represents a loss of about 0.1 to 0.2% of the secondary productivity over a 333 square km area of the Sound. It was shown that copepod mortality was affected primarily by the mechanical or hydraulic stresses of entrainment. Warming due to entrainment usually increased phytoplankton productivity by 5 to 25% in the cooler months and decreased by 60 to 95% in warmer months. Chlorination decreased primary productivity by about 80% even at low concentrations. (See also W76-08628) (Chilton-ORNL)
W76-08632

ENTRAINMENT STUDIES ON HUDSON RIVER ORGANISMS,
New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine.
G. J. Lauer, W. T. Waller, D. W. Bath, W. Meeks, and R. Heffner.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 37-82, 22 tab, 40 fig, 40 ref.

Descriptors: *Entrainment, *Thermal stress, *Chlorination, Plankton, Fish eggs, Larvae, Growth stages, Hudson River, Poulations, Environmental effects.

In this evaluation of the potential effects of the Indian Point Nuclear Power Station on the biota of the Hudson River estuary, representatives of all trophic levels, including microbial decomposers, phytoplankton, herbiverous and carnivorous zooplankton, small eggs and larvae of invertebrates and fish were considered. Laboratory thermal tolerance studies indicated that significant decreases in bacterial abundance occurred only at temperatures higher than those projected for normal plant operation. A significant decrease in ATP concentrations was noted in water samples obtained from condensers being chlorinated but data indicated that recovery to intake levels would occur before the water left the discharge canal. There was no evidence that the Indian Point facility was altering the abundance or species composition of phytoplankton. Microzooplankton numbers and species composition varied with seasonal factors. Macrozooplankton showed some mortalities with thermal stress and chlorination. Tolerance of fish eggs and larvae to temperature elevations varied with the developmental stages tested. (See also W76-08628) (Chilton-ORNL)
W76-08633

HUDSON RIVER STRIPED BASS LIFE CYCLE MODEL,
Lawler, Matusky and Skelly Engineers, Tappan, N.Y.
J. P. Lawler, R. A. Norris, G. Goldwyn, K. A. Abood, and T. L. Englert.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 83-94, 13 fig, 10 ref.

Descriptors: *Model studies, *Growth stages, *Striped bass, Life cycles, *Hudson River, Mortality, Population.

A mathematical model was designed to simulate the life cycle of the striped bass in the Hudson River with the goal of developing the capacity to predict the effect which the imposition of increased mortality at any point in the life cycle will have on the population as a whole. The model was based on the finite difference form of the one-dimensional advection-dispersion transport equation and was modified to include realistic source and decay terms for striped bass eggs and larvae. Results corresponded reasonably well with field data. The parameters of biological compensation, tidal effects and vertical non-homgeneity were not included in the model and the authors recommend improvement to include these factors. (See also W76-08628) (Chilton-ORNL)
W76-08634

ENTRAINMENT OF PLANKTONIC ORGANISMS INTO COOLING WATER SYSTEMS OF THREE MID-ATLANTIC THERMAL POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
L. D. Jensen, R. M. Davies, R. A. Smith, and A. S. Brooks.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 95-104, 6 fig, 2 tab, 10 ref.

Descriptors: *Entrainment, *Plankton, *On-site investigations, Sites, North Carolina, Virginia, Delaware, Powerplants, Fossil fuels.
Identifiers: Lake Norman, James River, Indian River.

The purpose of this research was to quantitatively examine, in field studies, plankton entrainment into the cooling water of three fossil-fueled power plants. This paper summarizes the characteristics of the three sites to be used in the study. Lake Norman, North Carolina is a large, deep, freshwater reservoir. There are no major discharges of organic waste streams into the lake but due to the stratified nature of the lake, its lower hypolimnetic layer was characterized by low dissolved oxygen levels. The James River, Virginia is a tidal river flowing into Chesapeake Bay. The James River receives considerable quantities of treated and untreated sewage. The Indian River, Delaware is an estuary connecting directly with the Atlantic Ocean. The estuary exhibits a range of surface salinity from 0 to 25 g/l in 20 km. The methods and results of this research are presented in additional papers. (See also W76-08628) (Chilton-ORNL)
W76-08635

PHYTOPLANKTON ENTRAINMENT STUDIES AT THE INDIAN RIVER ESTUARY, DELAWARE,
Johns Hopkins Univ., Baltimore, Md.
A. S. Brooks.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 105-111, 9 fig, 2 ref.

Descriptors: *Entrainment, *Phytoplankton, *Productivity, Cooling water, Temperature, Seasonal.
Identifiers: Indian River.

The effects of power plant entrainment on phytoplankton were found to be seasonal. Entrainment effects on carbon 14 uptake were primarily the result of temperature elevation. Mechanical factors influenced rates only slightly depending on the presence of fragile phytoplankton species. Rates of C 14 uptake were stimulated by a 6.5 degree C temperature rise when ambient temperatures were below 22 degrees C and reduced when ambient temperatures rose above 22 degrees C. Uptake rates were depressed from June through September while they were stimulated the remainder of the year. Length of exposure to elevated temperatures had little effect on uptake rates during the cooler months but long exposures during the summer depressed uptake production rates. (See also W76-08628) (Chilton-ORNL)
W76-08636

EFFECTS OF CONDENSER ENTRAINMENT ON ALGAL PHOTOSYNTHESIS AT MID-ATLANTIC POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. A. Smith, A. S. Brooks, and L. D. Jensen.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University on February 5-9, 1973. p 113-122, 12 fig, 2 tab, 10 ref.

Descriptors: *Entrainment, *Algae, Photosynthesis, Cooling water, Temperature, Mortality, Chlorination, Powerplants.
Identifiers: Lake Norman, James River, Gunpowder River, Indian River.

The response of algal photosynthetic rates to condenser temperature rises followed a consistent seasonal pattern at power plants located at Lake Norman, N. C., James River, Va., Gunpowder River, Md., and Indian River, Del. Rate stimulation from temperature rise prevailed when ambient temperature was low but was gradually replaced by rate depression when ambient temperature approached a summer maximum. A partial exception to this existed on Lake Norman where a hypolimnetic intake maintained low cooling water temperatures in summer. Irreversible effects of condenser entrainment on photosynthetic rates, which were assumed to reflect algal mortality, were observed only when intake temperature exceeded some threshold and during periods of chlorination. The temperature threshold varied seasonal and geographically but typically appeared between 25 and 30 degrees C. (See also W76-08628) (Chilton-ORNL)
W76-08637

EFFECTS OF CONDENSER DESTRUCTION OF ALGAE ON DISSOLVED OXYGEN LEVELS IN THE JAMES RIVER,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. A. Smith, and L. D. Jensen.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 123-129, 5 fig, 10 ref.

Descriptors: *Entrainment, *Dissolved oxygen, *Model studies, Algae, Mortality, Virginia.
Identifiers: James River(Va).

A model dealing with the dissolved oxygen system of a eutrophic region of the tidal James River is used to analyze the influence of algal destruction in the Chesterfield Power Station on oxygen levels. Results of model runs in the summer months indicated the net effect of all oxygen influencing factors associated with algal destruction is to lower dissolved oxygen concentrations by about 1 mg/l along an 11 km reach below the plant outfall. Flow and temperature conditions in fall months resulted in higher dissolved oxygen concentrations than those prevailing in summer. (See also W76-08628) (Chilton-ORNL)
W76-08638

ENTRAINMENT OF ZOOPLANKTON AT THREE MID-ATLANTIC POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. M. Davies, and L. D. Jensen.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland February 5-9, 1973. p 131-155, 39 fig, 11 tab, 39 ref.

Descriptors: *Entrainment, *Zooplankton, Powerplants, Cooling water, Temperature, Mortality.
Identifiers: Lake Norman, James River, Indian River.

The response of zooplankton to the effects of temperature rise, rapid pressure change, mechanical abrasion and biocidal action of chlorination were examined at Lake Norman, N. C., James River, Va., and Indian River, Del. Zooplankton mortality during entrainment was found to be dependent upon ambient temperatures and thermal elevations characteristic of each power plant. At the James River site the motility of zooplankton decreased in nearly direct proportion to ambient seasonal increases in water temperature, while at the Lake Norman site zooplankton motility decreased significantly at the lowest ambient water temperatures presumably due to doubling of the thermal elevation caused by operation of only one of the two cooling water pumps per unit during the coolest months of the year. (See also W76-08628) (Chilton-ORNL)
W76-08639

ZOOPLANKTON STUDIES AT MORGANTOWN,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. R. Heinle, H. S. Millsaps, Jr., and C. V. Millsaps.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9 1973. p 157-161, 2 tab, 5 fig, 2 ref.

Descriptors: *Entrainment, *Zooplankton, Chlorination, Density stratification, Tides, Copepods.
Identifiers: Acartia tonsa.

The influence of chlorination, tide, vertical distribution and augmentation pumping on a zooplankton index specie, Acartia tonsa, was investigated. In contrast to studies done at other sites, at Morgantown substantial numbers of dead copepods were found at the intake. High percentages of dead animals in the intake generally coincided with periods of slack tide. Results of statistical test of percentage alive during operating condition 1:499 kg (1100 lbs) of chlorine showed that there were no significant mortalities of Acartia tonsa between either the intake and the condenser or the intake and the effluent. Vertical stratification of copepods in the water column outside the power plant was greatest during flood tide and ebb tide and least during slack tide. (See also W76-08628) (Chilton-ORNL)
W76-08640

THE EFFECTS OF ENTRAINMENT ON PHYTOPLANKTON AT THE MORGANTOWN STEAM ELECTRIC STATION, POTOMAC RIVER ESTUARY, SEPTEMBER 5-8, 1972,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. A. Flemer.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9 1973. p 163-164, 2 fig, 4 ref.

Descriptors: *Entrainment, Zooplankton, Photosynthesis, Chlorophyll, Chlorination, Pumping, Estuaries, *Potomac River, Phytoplankton.
Identifiers: Morgantown Steam Electric Station.

Test conditions included no chlorine with augmentation pumping, no chlorine and no augmentation pumping, chlorine and no augmentation pumping. Samples were collected at the intake, the condensers and near the end of the effluent canal. Chlorophyll alpha concentration was used as an index of phytoplanktonic standing crop and the rate of C 14 uptake as an estimate of the photosynthetic rate. (See also W76-08628) (Chilton-ORNL)
W76-08641

BIOCHEMICAL STUDIES OF ENTRAINED PHYTOPLANKTON AT THE MORGANTOWN MARYLAND POWER PLANT,
Maryland Univ., Solomons. Chesapeake Biological Lab.
R. P. Morgan, II, D. A. Flemer, L. A. Noe, and V. J. Rasin, Jr.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 165-168, 3 tab, 6 ref.

Descriptors: *Entrainment, *Phytoplankton, *Biochemistry, Powerplants, Analytical techniques, Maryland.
Identifiers: Morgantown Steam Electric Station(Md).

The studies reported used the respiratory electron transport system (ETS), total proteins, ATP and ATPase activity as indices of the physiological state of phytoplankton community under power plant influence. Tests indicated that the protein only showed variation in relation to time. ETS activity in the effluent canal was about 15% higher than the intake indicating that there is reduced respiration through the condenser because of chlorination, mechanical effects or heat. Total ATP also showed a reduction of about 46%, when condenser values are compared to intake values. ATPase activity of the community increased by 39% after passage through the condenser and by 22% at the effluent canal. (See also W76-08628) (Chilton-ORNL)
W76-08642

MORGANTOWN ENTRAINMENT. PART IV. PHYTOPLANKTON TAXONOMIC STUDIES,
R. A. Mulford.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 169-175, 12 fig.

Descriptors: *Entrainment, *Phytoplankton, *Systematics, Powerplants, Screens, Algae, Biological communities, Maryland.
Identifiers: Morgantown Steam Electric Station(Md).

Two sample periods were chosen for the studies reported in this paper. One period was in late summer under maximum ambient heat conditions and one in December with lower ambient heat conditions and plant operating conditions having no chlorination and no augmentation pumping. Species composition of the net community for the warmer period provided a total of 79 species, 85% of which were dominated by the blue-green algae, Anacystis cyanea. Community composition for the December period was composed of 106 species with the blue green algae still the dominant organism. Approximately 66% of the net phytoplankton were immediately killed upon passage through the plant in the warm period. Approximately 15% were killed as a result of plant passage during the December test period. (See also W76-08628) (Chilton-ORNL)
W76-08643

RESPONSE OF PHYTOPLANKTON TO THERMAL STRESS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
M. E. Gurtz, and C. M. Weiss.
In: Entrainment and Intake Screening, Proceedings of the Sceond Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 177-185, 19 fig, 14 ref.

Descriptors: *Entrainment, *Phytoplankton, Productivity, Thermal stress, Growth rates, Screens.

The goals of this study were to define the relationship between the intake temperature, the magnitude of temperature rise and phytoplankton productivity as measured by C 14 uptake and to examine the relationship between the thermal effect and the growth capability of the phytoplankton under controlled laboratory conditions. A general pattern of increasing growth response with greater thermal stress was apparent, with smallest differences in the peak yields occurring at the lowest intake temperatures. (See also W76-08628) (Chilton-ORNL)
W76-08644

ENTRAINMENT STUDIES AT TURKEY POINT ON BISCAYNE BAY: HAVE THERMAL EFFECTS AFFECTED THE PLANKTON OF BISCAYNE BAY,
Air and Water Research, Inc., Gainesville, Fla.
J. B. Lackey.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 187-191, 3 fig.

Descriptors: *Entrainment, *Thermal stress, Plankton, Temperature, Algae, Thermal pollution, Florida.
Identifiers: Biscayne Bay(Fla).

Four years of research into the question of thermal effects are reported. It was generally concluded that there are definite thermal limits for all organisms and that these limits are variable for different species. The damage to plankton in the Biscayne Bay area was found to be restricted in quantity and to small areas and to small volumes of water. As long as temperatures did not exceed 34 degrees C over long periods of time, damage was negligible and water masses which may have suffered damage to their biota exhibited good recuperative capability. (See also W76-08628) (Chilton-ORNL)
W76-08645

LABORATORY SIMULATION OF POWER PLANT EFFECTS: RESPONSE OF SOME ESTUARINE PHYTOPLANKTERS TO TIME TEMPERATURE COMBINATIONS,
Academy of Natural Sciences of Philadelphia, Pa.
K. Mountford, R. S. Mullen, and R. S. Shippen.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 193-198. 10 fig, 5 ref.

Descriptors: *Entrainment, *Model studies, *Phytoplankton, Temperature, Time, Thermal stress, Thermal pollution.

In this laboratory simulation, a replicated 4 X 4 factorial matrix design was used to evaluate the response of phytoplankton to thermal shocks of 1 to 15 degrees C for exposure times ranging from 0 to 12 min. It was concluded that both light and acclimation temperature play an important role in thermal response of organisms. Certain communities of natural phytoplankton may be able to better withstand mild thermal shocks by seasonal shifts in the dominant species. There is a tendency for depressions to occur at relatively lower thresholds during the application of stress than during the recovery period. (See also W76-08628) (Chilton-ORNL)
W76-08646

TRAVELING SCREENS FOR TURBINE INTAKES OF HYDROELECTRIC DAMS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 8I.
W76-08647

FISH DIVERSION SYSTEMS AND BIOLOGICAL INVESTIGATION OF HORIZONTAL TRAVELING SCREEN MODEL VII,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 8I.
W76-08648

VULNERABILITY AND SURVIVAL OF YOUNG CONNECTICUT RIVER FISH ENTRAINED AT A NUCLEAR POWER PLANT,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
For primary bibliographic entry see Field 8I.
W76-08656

STATUS OF AIR BUBBLE FISH PROTECTION SYSTEM AT INDIAN POINT STATION ON THE HUDSON RIVER,
Consolidated Edison Co. of New York, Inc., New York. Office of Environmental Affairs.
For primary bibliographic entry see Field 8I.
W76-08657

PRELIMINARY STUDIES ON THE EFFECTS OF AIR BUBBLES AND INTENSE ILLUMINATION ON THE SWIMMING BEHAVIOR OF THE STRIPED BASS (MORONE SAXITALIS) AND THE GIZZARD SHAD (DOROSOMA CEPEDIANUM),
Westinghouse Electric Corp., Phildelphia, Pa. Environmental Systems. Dept.
For primary bibliographic entry see Field 8I.
W76-08658

A HIGH CAPACITY SAND FILTER FOR THERMAL POWER PLANT COOLING WATER INTAKES PART I: MODEL STUDIES AND FOULING CONTROL TECHNIQUES,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 8I.
W76-08660

A HIGH CAPACITY SAND FILTER FOR THERMAL POWER PLANT COOLING WATER INTAKES PART II: DESIGN CONCEPT,
Northwest Nuclear Power Associates, Seattle, Wash.
For primary bibliographic entry see Field 8I.
W76-08661

DEVELOPMENT OF BIOLOGICAL DESIGN CRITERIA FOR FISH SCREENS AND BARRIERS,
Kramer, Chin and Mayo, Inc., Seattle, Wash.
For primary bibliographic entry see Field 8I.
W76-08662

ABUNDANCE AND BIOMASS OF BACTERIOPLANKTON OF 'TASTAKA' PONDS, (IN RUSSIAN),
M. I. Novozhilova, and S. A. Abdrashitova.
Izv Akad Nauk Kaz SSR Ser Biol. 6, p 42-45, 1974.

Descriptors: *Fish hatcheries, *Plankton, *Biomass, Fertilizers, Bacteria, Ponds.
Identifiers: Kazakh-SSR, *Tastaka Pond, USSR.

Fertilization of the Tastaka fish-rearing ponds in the Kzyl-Orda region of the Kazakh SSR (USSR) with P salts had a weak effect on the development of bacterioplankton, but the application of N-P mixtures increased production considerably. The application of N-P fertilizers based on the pond's need for biogenic elements promoted a maximum increase of abundance and biomass of microorganisms and greatly reduced the expenditures for fertilizers during rearing of white anur larvae.--Copyright 1975, Biological Abstracts, Inc.
W76-08664

ROLE OF FAR EASTERN HERBIVOROUS FISH IN ECOSYSTEMS OF NATURAL WATER BODIES USED FOR ACCLIMATIZATION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Ichthyology.
G. V. Nikol'skii, and D. D. Aliev.
Vopr Ikhtiol. 14(6), p 974-979, 1974.

Descriptors: Rivers, *Carp, Phytoplankton, Plankton, Fish populations, *Cyanophyta, Algae, Ecosystems, Fish food organisms.
Identifiers: Aristichthys-Nobilis, Ctenopharyngodon-Idella, Hypophthalmichthys-Molitrix, Microcystis, Russian-SFSR, *USSR.

An analysis of the fish fauna of the Amur River (Russian SFSR, USSR) showed that grass carp Ctenopharyngodon idella and silver carp Hypophythalmichthys molitrix feeding on phytoplankton did not have any effect on the numbers of other fish. The same 2 spp.; variegated carp, Aristichthys nobilis and wild carp Cyprinus carpio living in the Kara Kum Canal feed on phytoplankton and blue-green algae, mainly Microcystis. A study of this canal in 1967-1973 revealed an increase in fish yield due to the colonization of this area by these phytophilic fish. The yield of C. carpio increased especially.--Copyright 1975, Biological Abstracts, Inc.
W76-08666

A SIX-YEAR WATER, PHOSPHORUS, AND NITROGEN BUDGET FOR SHAGAWA LAKE, MINNESOTA,
National Environmental Research Center, Corvallis, Oreg. Eutrophication and Lake Restoration Branch.
K. W. Malueg, D. P. Larsen, D. W. Schults, and H. T. Mercier.
Journal of Environmental Quality, Vol. 4, No. 2, p 236-242, April-June 1975. 11 fig, 5 tab, 11 ref.

Descriptors: *Phosphorus, *Nitrogen, Water pollution, *Water pollution effects, *Eutrophication, *Hydrologic budget, Nutrients, Waste water, *Minnesota.
Identifiers: *Shagawa Lake(Minn).

Water, phosphorus, and nitrogen budgets of eutrophic Shagawa Lake, Minnesota were determined from 1967-1972 to assist in defining the sig-

nificance of the loading from the city of Ely secondary waste water treatment plant to the trophic state of the lake. Ely's municipal waste water accounted for about 80% of the P, 24% of the N, and only 2% of the water to Shagawa Lake while the major tributary, Burntside River, accounted for 66% of the water, 42% of the N, and only 11% of the P to the lake. An average of 30% of the P was retained within the lake. The water and nutrient budgets, along with field and laboratory studies, indicated that high levels of P from the municipal waste water treatment plant were mainly responsible for the eutrophic condition of Shagawa Lake. These studies led to the construction of a tertiary waste water treatment plant designed to remove 99% of the P from the secondary waste water effluent. (Skogerboe-Colorado State)
W76-08674

THE EFFECTS OF LINDANE ON THE MORPHOLOGY AND THE GROWTH OF SOME UNICELLULAR ORGANISMS, (IN FRENCH),
Paris-7 Univ. (France). Laboratoire de Physiologie Cellular Vegetale.
N. Jeanne-Levain.
Bull Soc Zool Fr. 99(1), p 105-109, 1974.

Descriptors: *Microorganisms, *Morphology, Animal growth, *Pesticides, Water pollution effects, *Growth rates.
Identifiers: Amphidinium-Carteri, Dunaliella-Bioculata, Euglena-Gracilis, *Lindane, Tetrahymena-Pyriformis, Unicellar organisms.

A study was made of the effects of lindane (gamma HCH) upon the cytological structure and the growth of 4 aquatic unicellular organisms: Amphidinium carteri (Dinoflagellate) Euglena gracilis (Flagellate), Tetrahymena pyriformis (Ciliate) Dunaliella bioculata (Volvocales). A great diversity in the sensitivity to the pesticide was noticed in these different species. Generally the high concentrations of lindane are lethal and the lower concentrations induce a complete or partial delay in the cell multiplication. Microscopic examinations have shown some modifications of the behavior and the morphology of the treated organisms. Besides a specific inhibition of cytokinesis was observed in the Algae Dunaliella bioculata.--Copyright 1975, Biological Abstracts, Inc.
W76-08676

CHLORINATED HYDROCARBON PESTICIDES AND MERCURY IN COASTAL BIOTA, PUERTO RICO AND THE U.S. VIRGIN ISLANDS--1972-74,
Georgia Univ., Brunswick. Marine Resources Extension Center.
For primary bibliographic entry see Field 5B.
W76-08683

BASELINE CONCENTRATIONS OF POLYCHLORINATED BIPHENYLS AND DDT IN LAKE MICHIGAN FISH, 1971,
National Water Quality Laboratory, Duluth, Minn.
For primary bibliographic entry see Field 5A.
W76-08685

SEASONAL STUDIES ON THE RELATIVE IMPORTANCE OF DIFFERENT SIZE FRACTIONS OF PHYTOPLANKTON IN NARRAGANSETT BAY (USA),
Rhode Island Univ., Kingston. Graduate School of Oceanography.
E. G. Durbin, R. W. Krawiec, and T. J. Smayda.
Marine Biology, Vol. 32, No. 3, p 271-287, 1975. 8 fig, 2 tab, 33 ref. NSF GA 31319X.

Descriptors: *Productivity, *Marine algae, *Microorganisms, *Succession, *Phytoplankton, Temporal distribution, Dominant organisms, Size, Diatoms, Nannoplankton, Varieties, Bays, Temperature, Growth rates, Temperate, Cold regions, *Rhode Island, Estuaries, Seasonal, Eutrophication, Water pollution effects.
Identifiers: *Narragansett Bay(RI), Flagellates, Netplankton.

Between November 1972-October 1973, phytoplankton in Narragansett Bay were separated into sizes (less than 20, 20-60, 60-100, and over 100 micrometers) to determine their productivity. Cell numbers, species composition, chlorophyll, adenosine triphosphate levels, and carbon assimilation rates were determined to help define successional changes in composition, rates of turn-over, and roles of individual species. Diatoms were dominant in fall and winter-spring blooms and flagellates in summer. Nannoplankton (less than 20 micrometers) were most important, accounting for 46.6% of annual biomass as chlorophyll-a and 50.8% of total production. The relative importance of the fractions varied seasonally. Netplankton (over 20 micrometers) were most important in winter-spring and fall and nannoplankton in summer. Yearly mean assimilation numbers were not significantly different, but during winter-spring blooms assimilation numbers were higher for netplankton than nannoplankton. Temperature changes caused most of the variability in assimilation numbers. Growth rates were high. Short cycles in which the dominant species changed were related to changes in physiological population states. Usually higher growth rates were observed during peaks of phytoplankton abundance and lower growth rates between peaks. High growth rates and assimilation numbers suggested that phytoplankton were not generally nutrient-limited, consequently regeneration must be very rapid when in situ nutrient levels are low. (Buchanan-Davidson--Wisconsin)
W76-08686

MICROBIAL ATP AND ORGANIC CARBON IN SEDIMENTS OF THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
R. L. Ferguson, and M. B. Murdoch.
Estuarine Research, Vol. 1, p 229-250, 1975. 8 fig, 2 tab. AEC AT(49-7)-5.

Descriptors: Microorganisms, Organic compounds, *Carbon, *Sediments, *Estuaries, *North Carolina, Analytical techniques, *Standing crops, *Detritus, Chlorophyll, Measurement, Instrumentation, Cores, Seasonal, Food webs, Statistical methods, Photometry.
Identifiers: *Adenosine triphosphate, *Newport River Estuary(NC), *Organic carbon.

Methods for the quantitative estimation of the standing crops of organic carbon in sediment communities (allochthonous detritus, detritus, heterotrophic and autotrophic microbes, and microbial fauna) were devised. Seasonal surveys of microorganism, macroscopic infauna, and nekton biomass in the Newport River Estuary, North Carolina, are being made. Standing crops of carbon in heterotrophic and autotrophic microorganisms in water and sediments were estimated from adenosine triphosphate (ATP) and chlorophyll-a measurements. ATP was extracted with boiling tris (hydroxymethyl) aminomethane buffer. The extraction efficiency from sediment was approximately 47%. ATP was strongly absorbed by acid-washed clay, but ATP extractability from natural sediment was independent of its clay content. Instrumentation for the determination of as little as 0.0005 micrograms of ATP per ml of extract and a hand-coring device for collecting samples of shallow water sediment are described. The standing crop of heterotrophic microbes increased 8.4-20.9 g c/sq m from winter to summer in the upper 15 cm of sediment over the whole estuary. This increase was associated with a drop in detritus and increase in macroscopic infauna. Implications of seasonal carbon distributions in detritus, microbes, and infauna are discussed in relation to the apparent carbon flows through the detritivore food web. (Buchanan-Davidson--Wisconsin)
W76-08687

DETRITUS PRODUCTION IN COASTAL GEORGIA SALT MARSHES,
Georgia Univ., Sapelo Island. Marine Inst.
R. J. Reimold, J. L. Gallgher, R. A. Linthurst, and W. J. Pfeiffer.
Estuarine Research, Vol. 1, p 217-228, 1975. 7 fig, 2 tab, 20 ref.

Descriptors: *Rooted aquatic plants, *Detritus, *Salt marshes, *Estuaries, *Georgia, Standing crops, Biomass, Primary productivity, Tidal effects, Eutrophication, Water pollution effects.
Identifiers: Detritus production, *Duplin Estuary(Ga), Spartina alterniflora, Juncus roemerianus.

Changes in detritus production flux were measured each month in three salt marsh areas of the Duplin Estuary, Sapelo Island, Georgia, and detritus production calculated. Standing dead material often exceeded living material in the short-form Spartina alterniflora, but was about equal in other areas. The average dead material standing crop was highest in Juncus roemerianus and lowest in short-form S. alterniflora. Average detritus production fluxes were: 7 mg/g/day for tall-form S. alterniflora, 18 mg/g/day for short-form S. Alterniflora, and 7 mg/g/day for J. roemerianus. Average monthly detritus production was 197.9 g/sq m for J. roemerianus, and 113.6 g/sq m for short-form S. alterniflora. Mean annual detritus production from aerial portions of plants (weighted for percentage of watershed occupied by each stand) was 1845.8 g/sq m/yr. Flux rates of J. roemerianus and tall form S. alterniflora were low but detritus production high due to large biomass; short-form S. alterniflora biomass was low and flux rate more than twice that of the other stands. Monthly detritus productions varied. Minerals in dead material differed between species and seasons; phosphorus and molybdenum were lower and manganese higher in J. roemerianus. Calcium, magnesium, boron, and strontium were higher in August than in March in all species. (Buchanan-Davidson--Wisconsin)
W76-08688

PHOSPHORUS FLUX AND CYCLING IN ESTUARIES,
Smithsonian Institution, Rockville, Md. Radiation Biology Lab.
D. L. Correll, M. A. Faust, and D. J. Severn.
Estuarine Research, Vol. 1, p 108-136, 1975. 17 fig, 2 tab, 31 ref.

Descriptors: Analytical techniques, *Phosphorus, *Cycling nutrients, *Estuaries, *Chesapeak Bay, Periphyton, Plankton, Tidal marshes, Radioisotopes, Sediments, Phosphates, Absorption, Nannoplankton, Metabolism, Dinoflagellates, Bacteria, Chemical analysis, Kinetics, Chromatography, Microscopy, Detritus, Aquatic plants, *Pollutant identification.
Identifiers: *Rhode River(Chesapeake Bay), Microautoradiography.

To demonstrate application of experimental measurements of phosphorus flux rates and cycling in estuaries, results obtained in tidal marsh and mudflat periphyton and plankton communities of the Rhode River, a subestuary of Chesapeake Bay are presented. Phosphorus loading of a tidal marsh dominated by Typha angustifolia caused rapid radioactivity decreases. Microbes rapidly took up radioactive orthophosphate, the acid-labile fraction peaked quickly, then levelled off. Typha roots apparently absorbed phosphate from surface detritus, not tidal waters or deep sediments. Phosphate absorbed by periphyton was metabolically converted into organic phosphorus compounds. Phosphorus uptake rates were about equal to release rates. Effects of light in stimulating phosphorus uptake were about cancelled by light inhibition of heterotrophic uptake, indicating that uptake was not directly caused by photosynthesis

or autotrophs. Iodoacetic acid inhibited uptake, suggesting biological, no physical, uptake. Nannoplankton phosphorus assimilation was 300-500 times that of large dinoflagellates. Phosphorus uptake was greatest by bacteria on surfaces of suspended sediments and detritus. Phytoplankton took up some orthophosphate in the light. Filter feeders (especially ciliated protozoa) ingested bacteria and phytoplankton, then released most of the phosphorus as dissolved orthophosphate and organic phosphorus. Methods used were chemical analyses, radioactive phosphorus uptake, chase kinetics, column chromatography, continuous-flow pulse-labeling, microscopic examinations, and microautoradiography. (Buchanan-Davidson--Wisconsin)
W76-08689

CAUSES AND PROBABLY CORRECTIVES FOR OXYGEN DEPLETION FISH KILLS IN THE DICKINSON BAYOU ESTUARY: A FIELD STUDY AND SIMPLIFIED ALGAL ASSAY,
Texas Parks and Wildlife Dept., Seabrook. Seabrook Marine Lab.
K. Knudson, and C. E. Belaire.
Contributions in Marine Science, Vol. 19, No. 48, p 37-48, 1975. 7 fig, 10 ref.

Descriptors: *Oxygen sag, *Eutrophication, *Sewage effluents, *Fishkill, *Estuaries, *Texas, *Bioassay, Nutrient removal, Diurnal, Treatment facilities, Tertiary treatment, Dissolved oxygen, Tidal effects, Sewage treatment, Chlorophyll, Phosphorus.
Identifiers: *Dickinson Bayou(Tex), *Algal assay.

Summer fishkills due to oxygen depletion caused by dense algal blooms have occurred during the night or early morning in parts of the Dickinson Bayou, Texas, upstream from two sewage treatment plants. In the spring freshwater runoff dominates the circulation, salinity is negligible, and dissolved oxygen near saturation. Precipitation and runoff are negligible in summer; tides carry saline waters and sewage effluents upstream. Little mixing occurs, so bottom dissolved oxygen is low. Phosphorus and chlorophyll parallel saline concentrations. Algal density was less above the tidal influence and downstream from plant outfalls. When algal concentrations are dense, dissolved oxygen concentrations show extreme diel fluctuations. Algal assays indicated that tertiary waste treatment would reduce algal biomass two to four-fold as compared to secondary treatment. Thus, phosphorus removal may reduce algal standing crops 1/4-1/2, eliminate extreme diel dissolved oxygen fluctuations, and reduce the potential for fishkills. It was concluded that the two treatment plants were poorly located, because they discharge into normally stagnant, eutrophic, unstable areas. Site selection for waste treatment plants on tidal streams should be carefully considered to avoid nutrient build-up. (Buchanan-Davidson--Wisconsin)
W76-08690

NITROGEN UTILIZATION DURING SPRING BLOOMS OF MARINE PHYTOPLANKTON IN BEDFORD BASIN, NOVA SCOTIA, CANADA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
S. A. M. Conover.
Marine Biology, Vol. 32, No. 3, p. 247-261, 1975. 6 fig., 6 tab., 35 ref.

Descriptors: *Marine algae, *Nitrogen compounds, *Spring, *Canada, Diatoms, Nitrates, Nitrites, Ammonia, Urea, Limiting factors, Proteins, Lipids, Carbohydrates, Carbon, Dinoflagellates, Photosynthesis, Chlorophyll, Eutrophication, *Phytoplankton.
Identifiers: *Bedford Basin(Nova Scotia), Carotenoids, Thalassiosira fluviatilis, Thalassiosira nordenskioldii.

Spring phytoplankton flowering was dominated by diatoms using nitrates, nitrites, ammonium, and some urea. Flowering seemed dependent on nitrates in sea water. Environmental nutrient depletion occurred several days before the population maxima, so internal nitrogen storage carried diatoms populations through their remaining divisions. Total nitrogen/cell decreased as blooms matured, but intracellular nitrogen distribution remained constant. Protein nitrogen was 57.2% total particulate nitrogen. Protein carbon was greater in cells in developing and post-blooms than mature blooms. Lipid carbon was fairly constant, decreasing slightly in post-bloom dinoflagellates. Nitrogen-deficient phytoplankton channeled photosynthate into carbohydrates. Carotenoid/chlorophyll was useless for assessing population age or nitrient deficiency. Lipid/protein varied, was highest in mature floating blooms, and lowest in older, post-blooms, and sinking blooms. Carbohydrate/protein was higher in mature blooms and sinking phytoplankton than young blooms. Carbon/nitrogen was moderate in pre- and post-blooms, low in young blooms, and maximum in mature blooms. All nitrogen sources were normally used simultaneously, except urea. There was no threshold ammonium concentration above which nitrate was not used. Urea increases were observed occasionally. As blooms progressed, there is less response to added nitrogen. Nitrate apparently regulated bloom magnitude. Thalassiosira fluviatilis used all nitrogen sources, but T. nordenskioldii did not use urea. (Buchanan-Davidson--Wisconsin).
W76-08691

ENERGY TRANSFER IN SEDIMENTARY ENVIRONMENTS: THE CASE OF SULFATOREDUCERS: I. THE ORGANIC ACIDS IN LAGOON AND MARINE SEDIMENTS (GOLFE DU LION), (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
G. Cahet.
Vie Milieu Ser B Oceanogr. 24(2), p 235-255, 1974.

Descriptors: Lagoons, *Sediment transport, *Littoral, *Gulfs, Europe, *Sediment load, *Sulfates, Water pollution control, *Organic acids, *Acids.
Identifiers: *France, Golf du Lion, Mediterranean.

In the Mediterranean margino-littoral sediments of the Golfe du Lion (France), the temporal variations of organic acids depend upon their binding to deposit particles. A great part of the organic acid reserve is consistently found in the fraction that is most strongly bound to the sediment. The ratios of the different fractions have characteristic mean values. In lagoons, these compounds suggest possible heterotrophic action. In early diagenesis, glucides that are easily assimilated disappear rapidly. From a biological viewpoint, this emphasized the importance of the role of organic acids; but the amounts present do not account for the action of the sulfate reducing heterotrophs present. These microflorae must possess some metabiotic adaptions for their development.--Copyright 1976, Biological Abstracts, Inc.
W76-08718

ONE-DIMENSIONAL TEMPERATURE PREDICTIONS IN UNSTEADY FLOWS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-08738

COMPUTER MAPPING OF TURBIDITY AND CIRCULATION PATTERNS IN SAGINAW BAY, MICHIGAN FROM LANDSAT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W76-08746

WATER QUALITY EFFECTS OF A DREDGING DISPOSAL AREA,
Northwestern Univ., Evanston, Ill. Technological Inst.
R. J. Krizek, B. J. Gallagher, and G. M. Karadi.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE2, Proceedings Paper 12040, p 389-409, April 1976. 7 fig, 6 tab, 5 ref, 1 append. EPA 15070-GCK, R-800948.

Descriptors: *Dredging, *Water quality, *Waste disposal, Environmental engineering, *Channel improvement, Analytical techniques, Bottom sampling, Chemical analysis, Environmental effects, Landfills, Water pollution, Pollutants, Suspended solids, Waste storage, Sludge disposal, Pesticide residues, Sediments, Settling basins, Ohio.
Identifiers: Diked containment area, *Toledo(Ohio), *Dredge spoil, *Maumee River(Ohio), Dredges, Confined environments, Water budget, Disposal sites, Hopper dredge, Maintenance dredging, Diked enclosure.

The effect of the settling-basin concept on the water quality associated with a typical disposal site for polluted maintenance dredgings, and the fate of pollutants during a typical dredging and disposal cycle were determined between August 20, 1972 and December 20, 1972, in Toledo, Ohio. Over 100 samples of slurry influent, overflow effluent, groundwater, ambient river water, bottom sediments, and material from the hopper bins and overflow waters were collected and analyzed for standard physical, chemical, and microbiological parameters. It was concluded that only a small fraction of the pollutants are discharged via the overflow weir into the ambient river water; this is attributable to the fact that the polluting substances tend to associate with the solid particles, which settle out of the suspension and are retained within the diked enclosure. The water quality of the effluent resembled that of the ambient river water used as a carrier to pump the dredgings in slurry form from the hopper dredge into the disposal area. (Henley-ISWS)
W76-08749

5D. Waste Treatment Processes

CONTINUED EVALUATION OF IN-SITU-FORMED CONDENSATION POLYMERS FOR REVERSE OSMOSIS MEMBRANES,
Midwest Research Inst., Minneapolis, Minn. North Star Research Div.
For primary bibliographic entry see Field 3A.
W76-08116

RESEARCH ON ULTRAFILTRATION SYSTEMS UNDER SEAWATER DESALTING CONDITIONS,
Oxy Metal Industries (Intra) Inc., Santa Ana, Calif. Systems Engineering Div.
For primary bibliographic entry see Field 3A.
W76-08117

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 1-5 MGD PLANTS, PLANTS FOR HIGH PRODUCT RECOVERY,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08118

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 3-25 MGD LOW PRESSURE PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08119

ENVIRONMENTAL QUALITY AND INFLATION: A REGIONAL PERSPECTIVE ON THE COST-PUSH IMPACT OF THE 1972 PURE WATER LEGISLATION,
Lyndon B. Johnson School of Public Affairs, Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08151

WATER QUALITY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 5G.
W76-08155

EFFECT OF FLOCCULANTS ON THE SEDIMENTATION OF ORGANIC SOLIDS IN TANNERY UNHAIRING EFFLUENTS,
Eastern Regional Research Lab., Philadelphia, Pa.
J. E. Cooper, W. F. Happich, E. H. Bitcover, E. F. Mellon, and E. M. Filachione.
Presented at 29th Annual Purdue Industrial Waste Conference, May 8, 1974, Purdue University, West Lafayette, Indiana. 24 p, 1 fig, 9 tab, 8 ref.

Descriptors: *Tannery wastes, *Waste water treatment, *Flocculation, Effluents, Industrial wastes, *Polelectrolytes, *Electrolytes, Organic wastes, Solid wastes, Settling basins.
Identifiers: Unhairing effluents.

Effects were determined of various flocculants on the sedimentation of organic solids in tannery unhairing effluents. Several methods and agents were tried, including varying the order of addition. Alum was found unsuitable because of the need to lower the pH to 8 in order to cause flocculation which results in the release of hydrogen sulfide gas. Highest removals were obtained by first adding an anionic polyelectrolyte then a cationic polyelectrolyte followed by an inorganic electrolyte. Using this method, the COD was reduced by 56 percent and the volatile organic solids by 98 percent. (EPA-Corvallis)
W76-08164

SPRAY IRRIGATION OF POLUTRY PROCESSING WASTEWATER,
Campbell Soup Co., Camden, N. J.
D. D. Deemer.
Instrumentation in the Food and Beverage Industry, 1972, No. 1, p. 25-30. 6 fig, 4 tab, 3 ref.

Descriptors: *Food processing industsry, *Waste water treatment, *Return flow, Irrigation, Infiltration, Drainage, Treatment facilities, Industrial wastes, Biochemical oxygen demand, Suspended solids.
Identifiers: *Poultry processing wastes, *Spray irrigation treatment.

A case history and research and research evaluation of a spray irrigation system used for the treatment of poultry processing wastewater is presented. The treatment system consists of an infiltration-type spray irrigation system with the addition of an underground perforated drainage pipe network which collects some of the treated wastewater and transports it to a polishing pond. The system treats between 3 and 4 million gallons of wastewater per day. Studies have shown the treatment system to be extremely efficient from a BOD and suspended solids removal standpoint, averaging better than 98 percent removal. The research evaluation also covers the influence which soils and plant cover have on the efficiency of the system. (EPA-Corvallis)
W76-08165

UTILISATION OF BLOOD,
Agricultural Research Council, Langford (England). Meat Research Inst.
For primary bibliographic entry see Field 3E.
W76-08166

O2 INJECTION DOUBLES/TRIPLES BIOLOGICAL WASTE TREATMENT ACTIVITY.
Food Processing, September 1974, p. 56-57.

Descriptors: *Food processing industry, *Waste water treatment, *Oxygenation, *Biological treatment, Industrial wastes, Economic feasibility.
Identifiers: *Meat processing wastes, Upgrading biological treatment.

Biological reaction capacity of conventional activated sludge aeration tanks is doubled or tripled by the installation of a modular oxygen treatment system. Two units were used to upgrade an overloaded 60,000 gpd, 400 mg/l BOD5 treatment system, the facility now handles 120,000 gpd meat processing waste of 800 mg/l BOD5. The unit is designed for use in water depths of 8-30 feet. It has one moving shaft and impeller. No cover is required since the mixed liquor in the aeration tank is at a lower dissolve oxygen content than atmospheric equilibrium. Several module sizes will be available. Capital investment for the system is in the area of $100,000 per million gallons per day of capacity. (EPA - Corvallis)
W76-08167

DUCK-PROCESSING WASTE,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 3E.
W76-08168

REDUCTION IN OXYGEN DEMAND OF ABATTOIR EFFLUENT BY PRECIPITATION WITH METAL,
New York State Agricultural Experiment Station, Geneva.
R. H. Walter, R. M. Sherman, and D. L. Downing.
Journal Agriculture Food Chemistry Vol. 22, No. 6, p 1097-1099, 1974. 2 fig, 3 tab, 14 ref.

Descriptors: *Food processing industry, *Waste water treatment, *Oxygen demand, Treatment, *Chemical precipitation, Effluents, Industrial wastes, *Metals, Chemical oxygen demand, Biochemical oxygen demand, Iron, Manganese, Cobalt, Aluminum, Copper, Cesium.
Identifiers: *Meat packing wastes pretreatment.

One hundred per cent reduction in oxygen demand (BOD and/or COD) of abattoir effluent was achieved experimentally by generating in situ metallic complexes with which hemoglobin and other large molecules were precipitated. Sulfates of Fe(II), Fe(III), Co(II), Cu(II), Mn(II), Ce(IV), and Al(III) were dissolved in the effluent, and after a short interval of time, the pH was adjusted to pH 7.0-9.6 with NH4OH. Environmental considerations limited further studies to Fe2(SO4)3. The weight ratio of effluent treated to salt used was in the order of 103, which was equivalent to a COD/Fe2(So4)3 ratio of approximately 2. The critical parameter was pH. (EPA - Corvallis)
W76-08169

EGG-PROCESSING PLANT WASTES,
South Dakota State Univ., Brookings.
For primary bibliographic entry see Field 3E.
W76-08170

WATER-RECYCLE WASHING OF REFINED SOYBEAN OIL: PLANT SCALE EVALUATION,
Anderson Clayton Foods, Inc., Sherman, Tex.
For primary bibliographic entry see Field 3E.
W76-08171

PROTEIN AND FAT RECOVERY FROM EFFLUENTS,
Alwatech A. S., Oslo (Norway).
A. P. Hopwood, and G. D. Rosen.
Process Biochemistry, Vol. 7, No. 3, p. 15-17, March 1972. 4 tab, 9 ref.

Descriptors: *Food Processing Industry, *Waste Water Treatment, *Chemical Precipitation, Byproducts, *Flotation, Proteins, Biochemical oxygen demand, Effluents, Industrial wastes, Poultry.
Identifiers: *Meat-Packing Wastes, *Poultry Processing Industry, LSA Process, Protein recovery, Fat recovery.

A process is described which separates water-insoluble solids, including fat, by flotation, or insoluble solids plus freshly co-precipitated protein plus fat by flotation after chemical precipitation. It is used for the treatment of slaughterhouse and poultry packing waste waters. Plants are in operation in Scandinavia and under construction in U. K. Economic aspects of effluent treatment and product utilization are covered. The Alwatech process makes use of lignosulfonic acid (LSA) which at pH 3 precipitates proteins from solution. It is capable of removing 70-90 percent of the BOD from a slaughterhouse or poultry processing plant along with most of the protein nitrogen. Advantages are: (1) low space requirements, (2) an economic advantage over biological treatment for strong wastes, and (3) sludge produced at 5-15 percent solids. (EPA - Corvallis)
W76-08172

PAUNCH HANDLING AND PROCESSING TECHNIQUES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 3E.
W76-08173

REPORT ON METHODS OF CHROME RECOVERY AND REUSE FROM SPENT CHROME TAN LIQUOR,
Cincinnati Univ., Ohio. Tanners' Council Lab.
R. A. Hauck.
Journal of the American Leather Chemists' Association Vol. 67, No. 10, p. 422-430, October, 1972. 3 tab, 9 ref.

Descriptors: *Tannery Wastes, *Waste Water Treatment, *Water reuse, Industrial wastes, Recycling.
Identifiers: Process Change, *Chromium recovery, Chromium reuse.

Three methods are reported of chrome recovery and reuse in order to utilize the unspent portion of chrome (about 30 percent) in the tanning process. These three methods are reuse through replenishment, direct reuse of the spent liquor, and chrome recovery. A review of past work in reuse, is presented with reports of successful operation. Suggestions are given on possible modifications of the processes covered in the review. Direct reuse of the spent liquor, in either the pickle liquor or as float in tanning is discussed. Several methods of chrome recovery are reviewed precipitation with an alkali will produce the chromium in a form suitable for reuse in a fresh liquor. Procedures are given for preparing the product for reuse along with tables showing the amount of various alkali necessary per quantity of chromic oxide. (EPA - Corvallis)
W76-08174

SOME ASPECTS OF TANNERY EFFLUENT CONTROL,
Garden State Tanning Co., Reading, Pa.
S. M. De.
Journal of the American Leather Chemists Association, Vol. 68, No. 8, p. 316-321, August 1973. 4 tab, 9 ref.

Descriptors: *Tannery wastes, Sulfides, Chromium, Chemical precipitation, *Waste water treatment, Industrial wastes, Pennsylvania, *Oxidation, Effluents, Treatment facilities.
Identifiers: Catalytic Oxidation, Process change, Chrome recovery.

Efforts to reduce the strength of the Garden State Tanning Co., Reading, Pennsylvania are reported. Initial efforts were toward the reduction of sulfide. A 40 percent decrease was obtained by adopting a hide processor. To reduce the remaining sulfide, several methods were evaluated including treating with ferrous sulfate to precipitate an insoluble ferrous sulfide, and oxidation of ferrous sulfide using manganese sulfate as a catalyst. Also studied was the use of nickel chloride and manganese chloride as catalysts. Pilot-plant experiments gave encouraging results for the use of manganese sulfate. Best oxidation was obtained when the amount of Mn++ added is one tenth the amount of S present in the system and when the catalytic agent is dissolved prior to addition in the aeration tank. Chrome was recovered using the optimum amount of lime and Primafloc A-10 (Rohm and Haas) for the most rapid precipitation without formation of cloudiness and discoloration. The most optimum quantities for every 170 liters of exhaust chrome liquor, were 852.7 grams lime powder and 157.5 grams Primafloc A-10. The chrome sludge was then dissolved in concentrated sulfuric acid forming chromium sulfate for reuse in tanning. (EPA - Corvallis)
W76-08175

TREATMENT OF TANNERY WASTEWATER FROM BONA ALLEN, INC., BUFORD, GEORGIA,
Cincinnati Univ., Ohio. Dept. of Civil and Environmental Engineering.
R. N. Kinman.
Journal of the American Leather Chemists Association, Vol. 68, No. 9, p. 370-392, September 1973. 2 fig, 15 tab, 2 ref.

Descriptors: *Tannery wastes, *Waste water treatment, Waste treatment, Industrial Wastes, Georgia, *Aerated lagoon, Activated sludge, *Treatment facilities.

The options studied for upgrading the Bona Allen, Inc., wastewater treatment plant at Buford, Georgia are described. Considered were treatment efficiencies of an activated sludge unit and an aerated lagoon for the tannery effluent. The existing system consisted of screening, equalization, chemical feed, primary clarification, trickling filter, and secondary clarification. The aerated lagoon was chosen for use after secondary clarification due to ease of operation and uniformity of the effluent. In the aerated lagoon over a 40 day operation period following percent removals were obtained; 48.1 for BOD5, 17.1 for color, and 17.2 for tannin. (EPA-Corvallis)
W76-08177

RECYCLING OF LIME-SULPHIDE UNHAIRING LIQUORS - I, SMALL-SCALE TRIALS,
Commonwealth Scientific and Industrial Research Organization, Parkville (Australia). Div. of Protein Chemistry.
C. A. Money, and U. Adminis.
Journal of the Society of Leather Technologists and Chemists, Vol. 58, p. 35-40, 1974. 5 tab, 5 ref.

Descriptors: *Tannery wastes, Sulfides, *Recycling, Industrial wastes, Waste water treatment, Water reuse.
Identifiers: Process change, Beamhouse wastes, *Unhairing liquors.

Results of small-scale trials on recycling of lime-sulfide unhairing liquors are reported in which the liquors have been recycled up to 27 times without deterioration in leather quality. Different soak methods were compared to determine which did not cause a buildup of salt in the liquor that would affect the swelling and unhairing. Matched-side trials were conducted comparing (1) conventional unhairing and unhairing with lime recycle after solids removal, (2) conventional unhairing and unhairing with lime recycle and no solids removal, and (3) unhairing using lime recycle with solids and unhairing using lime recycle without solids. All three trials produced no inferior quality leather. Fats accumulate in recycled lime liquors if the solids are not removed. Advantages of reutilizing lime liquors are the improved effluent quality and the savings in water use. The work has been extended to large-scale tannery trials. (EPA-Corvallis)
W76-08179

THE ROLE OF HIGH RATE BIO-FILTERS IN THE LEATHER INDUSTRY,
Water Pollution Research Lab., Stevenage (England).
D. A. Bailey, M. K. Leafe, K. S. Robinson, and S. Collins.
Journal of the Society of Leather Trades' Chemists, Vol. 56, p 200-214 (1972). 4 fig, 5 tab, 13 ref.

Descriptors: *Tannery wastes, *Waste water treatment, Waste treatment, Industrial wastes, Pre-treatment(Water).
Identifiers: *Bio-filter, Pretreatment.

Four possible applications of high rate bio-filters in the leather tanning industry are (1) as a pretreatment for effluents prior to municipal treatment, (2) as a roughing process prior to treatment in a conventional plant to reduce size and cost of new plants, (3) as a roughing process to relieve an overloaded existing plant, (4) as a 'partial' biological treatment for effluents discharged to river estuaries. Reports on pilot plant operation of the high-rate bio-filter in the leather industry show an average removal of 40 percent of the applied BOD. Chemical pretreatment with lime and iron or alum salts would reduce the size of subsequent biological treatment. Cost comparison with conventional filters shows the high-rate filter is preferable. (EPA-Corvallis)
W76-08180

A VERY RAPID LIMING AND TANNING PROCESS WITHOUT EFFLUENT,
Technische Hochschule, Darmstadt (West Germany). Institut fuer Makromolekulare Chemie.
For primary bibliographic entry see Field 3E.
W76-08181

NO-EFFLUENT TANNERY PROCESSES,
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
For primary bibliographic entry see Field 3E.
W76-08182

RECENT INVESTIGATIONS INTO THE DISPOSAL OF TANNERY WASTE WATER,
Instituut TNO voor Leder en Schoenen, Waalwijk (Netherlands).
P. J. van Vlimmeren, and A. J. J. van Meer.
(Paper presented to the Tanner's Production Club of Canada, Toronto, April 19, 1974, 14 p, 8 slides, TNO number 187/74L).

Descriptors: *Tannery wastes, *Water consumption, *Waste water treatment, Costs, Industrial wastes, Sulfides, Oxidation lagoons, Chromium, Waste water disposal.
Identifiers: *Process change, Beamhouse waste, Tanhouse waste, Oxidation ditch.

New developments in the disposal of tannery waste water were reported. Three areas of concern are discussed and are as follows: (1) Reduction in the amount and degree of pollution of the effluent, (2) treatment of tannery wastewater and, (3) charges to be paid. Water use reduction is reported from 100-200 l/kg of hide to 25 l/kg by the introduction of batch washing to replace continuous rinsing. Other methods to reduce the waste load reported are mixing of beamhouse and tanhouse waste flows, hair-save unhairing, and unhairing in the first soaking liquor. In the latter case, after acidification to pH 3.5 and settling, the COD and nitrogen content in the effluent from soaking-unhairing was reduced by 89 to 90 percent, respectively. Tannery wastewater treatment is centered on the areas of sulfide removal, chromium removal, and biological oxidation. The recommended treatment for sulfides is oxidation after addition of a manganous salt as a catalyst. Due to increasing stringent regulations regarding chromium, the authors recommend recovery from the spent liquor and reuse in the tanning operations. For biological treatment, the advantages of an oxidation ditch are discussed with reports of successful full-scale operation. Various surcharge systems for payment when discharging to municipal treatment are discussed along with a system developed by the Institute for Leather and Shoe Research which is in use in Holland today. (EPA-Corvallis)
W76-08183

WASTE TREATMENT AND CONTROL AT LIVE OAK POULTRY PROCESSING PLANT,
Gold Kist Inc., Atlanta, Ga.
For primary bibliographic entry see Field 3E.
W76-08185

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, TEXTILE INDUSTRY.
Lockwood Greene Engineers, Inc., Spartanburg, S. C.
For primary bibliographic entry see Field 5G.
W76-08186

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, CANNED AND PRESERVED FRUITS AND VEGETABLES,
Environmental Associates, Corvallis, Oreg.
For primary bibliographic entry see Field 5G.
W76-08187

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE ORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08188

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE INORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08189

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES PETROLEUM REFINING INDUSTRY, PART 1, CHAPTERS -V.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08190

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, PETROLEUM REFINING INDUSTRY, PART 2, CHAPTERS VI - IX.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08191

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, THE PERMIT PROGRAM.
Energy and Environmental Analysis, Inc., Arlington, Va.
For primary bibliographic entry see Field 5G.
W76-08193

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, CONSTRUCTION GRANTS.
Touche, Ross and Co., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08194

AN ANALYSIS OF U. S. ENVIRONMENTAL PROTECTION AGENCY'S NEEDS SURVEY,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-08195

SOLID MINERAL AND REGENERANT RECOVERY FOR ION-EXCHANGE RESINS,
Aerojet-General Corp., El Monte, Calif. (Assignee).
For primary bibliographic entry see Field 3A.
W76-08199

STERILIZATION OF HOLDING TANKS AND TOILET BOWLS BY QUATERNARY COMPOUNDS,
Baylor Coll. of Medicine, Houston, Tex. (Assignee).
J. L. Melnick, and C. Wallis.
U.S. Patent No. w,941,696, 5 p, 4 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 339, March 2, 1976.

Descriptors: *Patents, *Waste water treatment, Water quality control, Water pollution control, *Water pollution treatment, Odor, Viruses, Bacteria, Fungi, Methane bacteria, Waste storage, Hydrogen ion concentration, *Sterilants.
Identifiers: *Quaternary compounds.

Wastewaters heavily laden with organic compounds and containing viruses and other microbiological flora are sterilized and maintained sterile for prolonged periods of time by the addition of a base, such as lime, and a quaternary compound, prferably cetyl pyridinium chloride, in amounts to maintain the pH of the wastewaters at about 9-11, or higher, and with sufficient quaternary compound for suspended solids present. This prevents the formation of methane gases, which are tentative hazards in that they are inflammable, asphyxiant and narcotic. Similarly, toilets are rendered sterile by the addition of the base and quaternary compound so that, upon flushing, aerosols generated will not contain active infectious agents. All bacteria and fungi are inactivated under these basic conditions by the addition of quaternary compounds. Viruses are also inactivated under these basic conditions but only with quaternary compounds which contain the pyridinium moiety. Products for and methods of sterilizing wastewaters are included and a number of examples are given. (Sinha - OEIS)
W76-08201

APPARATUS FOR CONTINUOUS DEWATERING OF AQUEOUS SUSPENSIONS,
Passavant-Werke, Michelbach (West Germany). Michelbacherhutte. (Assignee).
U. Stahl, O. Busse, H. Klesper, and W. Junker.
U.S. Patent No. 3,941,701, 4 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 341, March 2, 1976.

Descriptors: *Patents, *Waste water treatment, Water purification, Water quality control, Water pollution control, *Water pollution treatment, Filtration, *Dewatering, Filters, Sludge treatment.
Identifiers: Filter belt.

Apparatus for the continuous dewatering of aqueous suspensions such as slurries and sludges resulting from the purification of waste water is described. An endless filter belt has its upper flight passing through a feeding and initial partial dewatering zone while engaging a perforated backing sheet. The upper flight then passes through a main dewatering zone while being exposed to a positive pressure and/or a negative pressure. The backing sheet is provided with grooves, slots or similar passages which extend at an angle to the direction of travel of the belt and in closely spaced relation to one another so as to leave small strips on the backing sheet which support the filter belt. Due to this arrangement the passage of liquid through the sludge layer and the porous filter belt is greatly improved. Also, the friction caused by engagement of the filter belt with the strips extending between the grooves and/or slots serves to overcome the adhesion of liquid to the filter belt. A negative pressure is created at the underside of the filter belt due to movement of the belt over the edges of the strips. (Sinha - OEIS)
W76-08202

LIQUID CONDITIONING AND SETTLING TANKS,
R. P. Moore.
U. S. Patent No. 3,941,704, 4 p, 3 fig, 16 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 342, March 2, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water purification, *Settling basins, *Sludge, Sludge treatment, Flocculation, Separation techniques, Equipment.
Identifiers: Sludge blanket.

In liquid conditioning and settling tanks liquid to be treated is mixed with floc forming chemicals. The floc particles collect the impurities in the liquid leaving it clear. As the floc particles collect the impurities they become heavier and tend to settle to the base of the tank leaving clarified liquid which is drawn off at the top of the liquid. In such tanks a 'sludge blanket' is maintained in suspension in the lower portion of the tank by agitation in that portion. The sludge blanket serves to trap impurities, provides nuclei for the formation of new floc particles and is believed to aid to a certain extent the chemical reaction from which the floc particles result. The improvement of this invention is a sludge concentrating receptacle or sump within the lower portion of the tank defining a substantially quiescent zone in the tank. The receptacle or sump has an inlet lip above the base of the tank to receive sludge particles from the surface of the sludge blanket and an outlet for discharging concentrated sludge from the tank. The sump may include a well which tapers downward to a drain. (Sinha - OEIS)
W76-08203

PURIFICATION OF EFFLUENT,
Air Liquides Societe Anonyme Pour et L'Exploitation des Procedes, Paris (France). (Assignee).
P. Boulenger.
U.S. Patent No. 3,945,916, 4 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1905, March 23, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, Water quality control, Water pollution control, Oxygenation, Activated sludge, Equipment, Effluents.

A process is described for the purification of effluent using an oxygen-rich gas in which the effluent is mixed with a biologically activated sludge. The effluent/sludge mixture thus obtained is oxygenated and then is introduced into a treatment zone in which a quantity of activated sludge is fixed on vertically-disposed, mobile discs immersed within the treatment zone and a further quantity of activated sludge is in suspension in the effluent undergoing treatment. The invention also relates to an installation for carrying into effect the process described. (Sinha - OEIS)
W76-08206

DECOLORIZING METHOD FOR WASTE KRAFT PAPER MILL EFFLUENTS,
Westvaco Corp., New York. (Assignee).
P. D. Foster.
U.S. Patent No. 3,945,917, 5 p, 4 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1905, March 23, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution effects, *Water pollution treatment, Water quality control, Water pollution control, *Pulp wastes, Fibers, Pulp and paper industry, Color, Hydrogen ion concentration, Barium, Effluents.
Identifiers: *Decolorization.

Considerable reduction in color of a kraft paper mill effluent has been found with the addition of barium ions (Ba+2) to the effluent. Unlike the familiar lime decolorization process for kraft paper mill effluents, decolorization using barium is substantially independent of the pH of the effluent and the color removing mechanism is in the form of an occlusion of the color bodies from the effluent into the barium sulphate precipitate (BaSO4) which forms from the sulphate (SO4) already present in or added to the effluent. The amount of decolorization produced by the process of the present invention depends upon the amount of sulfate ions in the effluent, the amount of barium ion containing material added to the effluent and the relationship of the amount of barium to the amount of sulphate in the effluent. A slight excess of sulphate over the stoichiometric equivalent of barium is desired, and the total amount of barium ion containing material and sulphate that must be added to the effluent depends on the initial color of the effluent and the degree of decolorization desired. (Sinha - OEIS)
W76-08207

PROCESS FOR THE ENVIRONMENTALLY FAVORABLE DESTRUCTION OF SOLID AND/OR LIQUID CYANIDE WASTE,
Deutsche Gold- und Silber-Scheideanstalt A. G., Frankfurt-am-Main (West Germany). (Assignee).
U. Schindewolf.
U.S. Patent No. 3,945,919, 3 p, 9 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1906, March 23, 1976.

Descriptors: *Patents, *Waste water treatment, *Chemical wastes, *Water pollution treatment, Water quality control, Water pollution control, Catalysts, Heat treatment, Pressure.
Identifiers: *Cyanides.

A process is described for destroying liquid or solid cyanide waste under environmentally favorable conditions consisting essentially of providing the cyanide with water in the presence of a salt of a transition metal as a catalyst and heating the aqueous mixture to a temperature of 120 deg to 200 deg C. at superatmospheric pressure to form ammonia and formic acid or a salt thereof. The process can take place continuously in a simple manner in a pressure tube, no poisonous waste products are formed, and the salts left behind accumulate in a highly concentrated form and therefore can be easily drawn off. (Sinha - OEIS)
W76-08208

ION-EXCHANGE GROUP BEARING COMPOSITE MEMBRANES,
Kanegafuchi Kagaku Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 3A.
W76-08211

INNOVATIVE TECHNOLOGIES FOR WATER POLLUTION (ABATEMENT).
Water Purification Associates, Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-08220

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, URBAN RUNOFF.
Black, Crow and Eidsness, Ind., Atlanta, Ga.; and Jordan, Jones and Goulding, Inc. Atlanta, Ga.
For primary bibliographic entry see Field 5G.
W76-08222

OXIDATION DITCH TREATMENT OF MEAT PACKING WASTES,
Iowa Univ., Iowa City. Dept. of Civil (Environmental) Engineering.
W. L. Paulson, D. R. Kueck, and W. E. Kramlich.
(Water Pollution Control Research Series 12060---03/71). Presented at 2nd National Symposium on Food Processing Wastes, March 1971. p 617-635, 3 fig, 5 tab, 6 ref. EPA 12060 EUB.

Descriptors: *Food processing industry, *Waste water, Treatment, *Activated sludge, Industrial wastes, *Oxidation lagoons, Operations, Treatment facilities, Performance, Aeration.
Identifiers: *Meat packing wastes, *Oxidation ditch.

The design and early operation of a 3.25 mgd channel aeration activated sludge wastewater treatment plant are described. The plant treats the wastewater from the hog and beef meat packing plant of John Morrell and Co., Ottumwa, Iowa. The plant includes pre-aeration, primary settling and grease removal,and treatment in two aeration channels (40ft wide X 6 ft deep) in parallel. The overall length is 1050 ft. The aeration channels utilize rotor and floating aerators. One channel utilizes an experimental straightline settling unit (16ft X 475 ft X 6 ft deep). The plant has experienced considerable operational difficulties with solids removal via tubular conveyors in primary units, rotor and floating aerators and in the straightline settling unit. Initial performance data indicate that the plant will meet an effluent BOD5 value of 75 mg/l or less with alterations in aeration capability and sedimentation unit changes. Plant modifications are being developed. Experimental animal feeding studies with recovered waste activated sludge will be conducted. (EPA-Corvallis)
W76-08223

ACID COAGULATION AND DISSOLVED AIR FLOTATION,
Meat Industry Research Inst., Wellington, (New Zealand).
B. H. P. Wilkinson.
Presented at Research Conference on Meat Industry of New Zealand, 1971, V. 225, p 52-53.

Descriptors: *Food processing industry, Industrial wastes, *Waste water treatment, *Flotation, *Coagulation, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Coliforms.
Identifiers: *Meat-packing wastes, Acid coagulation, Dissolved air flotation.

Dissolved air flotation is used in the process of extracting acid-coagulated proteinaceous material, fat and other surface active materials from meat processing plant effluent. The protein is precipitated at its iso-electric point, pH 4.0-4.5, which increases the floc size and makes the proteins more amenable to removal by dissolved air flotation. Pilot plant studies have evaluated the process with respect to suspended solids (SS), COD, BOD, and coliform reduction. Removals were 85-95 percent SS, 70-80 percent COD and BOD, and greater than 99 percent coliforms. (EPA-Corvallis)
W76-08224

USE OF CRUSHED LIMESTONE TO NEUTRALIZE ACID WASTES,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5G.
W76-08225

OXYGEN RELATIONSHIPS IN A SOIL TREATED WITH SEWAGE EFFLUENT,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
S. D. Klausner, and L. T. Kardos.
Journal of Environmental Quality, Vol. 4, No. 2, p 174-178, April/June, 1975. 1 fig, 4 tab, 15 ref. OWRT B-001-PA(11), 14-01-001-837.

Descriptors: *Soil analysis, *Sewage disposal, *Effluents, Aeration, Oxygen, Ammonium, Nitrogen, Irrigation.
Identifiers: *Land application, Oxygen diffusion rates.

The effects of applying chlorinated, secondary sewage effluent on two aeration parameters, oxygen diffusion rate and concentration of oxygen in the soil gas, were studied. The effects of applying the sewage effluent on several chemical parameters which may be affected by differing aeration conditions, notably, the concentrations of NH4+, NO3-, and NO2- nitrogen, and iron and manganese in the soil water, were also evaluated. Water samples and oxygen diffusion and concentration measurements were taken on a weekly basis from a loamy field watered with secondary treated sewage effluent during a four-year rotation of oats, hay and corn. The concentration of nitrogen, iron, and manganese was analyzed weekly from the soil water samples. As weekly application of effluent changed from 0 cm to 2.5 cm to 5.1 cm, average gaseous oxygen concentrations to a depth of 46 cm ranged from 19.6 to 19.0 to 18.4%. Oxygen diffusion rates (ODR) were not significantly different for the three effluent levels but values diminished with depth with a minimum of 15 at 46 cm and a maximum of 27 at 8 cm. Gaseous oxygen concentration was not affected by crop cover but ODR was less under hay than under corn. Water samples obtained at depths of 15.2 and 61 cm showed that nitrite levels were very low. Ammonium-N levels were greater in the 5.1 cm effluent treatment but there were no differences due to vegetation cover or soil depth. Manganese and iron levels were not affected by effluent treatment. The weekly 5.1 cm application of sewage effluent did not degrade the aeration condition of the soil. (Loustau-FIRL)
W76-08231

UNDERGROUND DETENTION FOR STORM OVERFLOWS.
For primary bibliographic entry see Field 8G.
W76-08234

SAFEGUARD FLUID-HANDLING EQUIPMENT WITH PIPELINE BASKET STRAINERS,
Hayward Mfg., Co., Inc., Elizabeth, N. J.
For primary bibliographic entry see Field 8G.
W76-08235

POLYETHYLENE PIPE SOLVES PROBLEM OF FORCE MAIN SEWER LINE INSTALLATION ACROSS INLAND WATERWAY.
For primary bibliographic entry see Field 8F.
W76-08236

HALF-SECTION PIPE USED EFFECTIVELY,
For primary bibliographic entry see Field 8F.
W76-08237

ABOUT THE PROBLEM OF DIRECT RUNOFF DETERMINATION BY SEPARATION OF THE HYDROGRAPH COMPONENTS (K OTAZKE URCENIA PRIMAEHO ODTOKU SEPARACIOU PRIETOKOVYCH VLN),
For primary bibliographic entry see Field 2A.
W76-08238

FAST REPLACEMENT OF A FLOOD-DAMAGED INTERCEPTOR,
Metropolitan Denver Sewage Disposal District No. 1, Commerce City, Colo.
For primary bibliographic entry see Field 8F.
W76-08240

COMBINATION SEWAGE TREATMENT AND COOLING SYSTEM,
Cherne Industrial, Incorporated, Edina, Minn. (Assignee).
L. J. Boler.

Descriptors: *Sewage treatment, *Conduits, *Cooling, Aeration, Sewage, *Patents, *Waste water treatment, Evaporation control, Settling basins.
Identifiers: Settling tanks.

A sewage treatment and cooling system has been patented. The system includes a sewage treatment conduit in which liquid sewage is conveyed along an extended continuous loop or recirculating path, with means for introducing additional sewage at a minimum of one point along the conduit, and with means for feeding at least a portion of the liquid from the conduit through the cooling condensers of an operating plant and back into the sewage treatment conduit. Propulsion and treating means are included for maintaining a minimum rate of flow in the conduit to prevent settling of solids and to aerate the liquid. A plant cooling system pumping means serves as one propulsion means for moving the liquid through the conduit. Liquid in the conduit is aerated both to cool it for reuse in the cooling system and to achieve oxygen enrichment which will promote the desired sewage treatment. Liquid is removed from the sewage treatment conduit to settling tanks at a rate equal to the rate of incoming flow of sewage, less evaporation and other losses. (Sandoski-FIRL)
W76-08242

LAKE MICHIGAN GETS HELP,
Milwaukee Sewerage Commission, Wis.
R. D. Leary, and D. T. Lundy.
Water and Wastes Engineering, Vol. 10, No. 9, p 64-67, September, 1973. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Water pollution control, *Treatment facilities, Storm runoff, Lake Michigan, Sewage, Aeration, Chlorination, Conduits, Effluents, Outlets, Pipelines, Outfall sewers, Wisconsin, Phosphorus, Lakes.
Identifiers: *Phosphorus removal, Modernization, Milwaukee(Wisc).

Expansion and modernization of two waste water plants is helping Milwaukee, Wisconsin, protect the waters of Lake Michigan. Unique features at the Jones Island plant include fine and coarse screening instead of primary settling basins, the use of waste pickle liquor for effective phosphorus removal at almost negligible cost, and sludge disposal by production of a commercially-marketed fertilizer under the name Milorganite. Included in the modernization project is the use of waste heat from the generators to aid in the drying process of Milorganite production. The South Shore plant capacity is rated at 120 mgd but provisions have been made to accomodate three times this flow through the treatment process with bypassing of sewage into the lake. Aeration basins are designed for conventional and step aeration, the final settling basins are octagonal in shape, plant units are arranged to provide for any quarter of the plant to be isolated and operated independently in times of storm flow or for experimental purposes, and chlorination of the effluent is effected in the outfall conduit with the necessary detention time being provided in the 132-inch pipeline extending approximately 2000 feet into Lake Michigan to a water depth of 25 feet. (Sandoski-FIRL)
W76-08246

REGIONAL AGENCY STARTS UP PHYSICAL-CHEMICAL TREATMENT PLANT.
Environmental Science and Technology, Vol. 7, No. 9, p 804-805, September, 1973. 1 fig.

Descriptors: *Waste water treatment, *Treatment facilities, Sewage, Filters, Filtration, Suspended solids, Ion exchange, Adsorption, Tertiary treatment, Clarification, Chemical precipitation, Minnesota.
Identifiers: Rosemont(Minn), Ammonia removal, Physico-chemical treatment, Dual media filters.

A $2 million advanced waste water treatment plant at Rosemount, Minnesota, is nearing completion under the supervision of the Sewer Board System. The plant is designed for a 600,000 gpd average capacity with sizable expansion possible. Raw sewage enters the plant through a one-inch bar screen that removes large objects and trash. After flowing by gravity through a common flume into a wet well, the sewage is divided into two separate treatment trains. The first process component in each train is an Ecodyne Reactivator clarifier which uses lime to precipitate phosphates as calcium phosphate. After clarifier retention of four hours, effluent pH is lowered from 11 to 8.5 before entering four ecodyne Graver Monoscour filters (two filters handle each section of the stream). The dual media filters reduce inorganic and organic suspended solids to 3-5 ppm in filtered effluent. After filtration, the effluent is pumped to a filtered water holding tank, water is pumped to six carbon adsorption tanks, three on each stream, for removal of dissolved organics. The effluent then enters a secondary set of four Ecodyne Monoscour filters to remove fine solids, flows to another holding tank and then into an ion exchange vessel for ammonia removal. Effluent from the ion exchange system, the last treatment step, is discharged from the plant with less than one ppm ammonia nitrogen. (Sandoski-FIRL)
W76-08248

ECONOMICAL FOAM CONTROL IN WASTEWATER TREATMENT SYSTEMS,
Nalco Chemical Co., Chicago, Ill.
J. A. Hyde.
Water and Sewage Works, Vol. 120, No. 8, p 56-57, August, 1973. 3 fig.

Descriptors: *Waste water treatment, *Automatic control, Electrodes, Aeration, *Foaming, Control systems.
Identifiers: Antifoam feed system, Chemical feed rate, Aeration basins.

Excessive foam in the aeration basin of a waste water treatment plant can interfere with oxygen uptake of the microorganisms and inhibit BOD reduction. An automatic antifoam feed system in which the system senses changing demand for anti-foam and adjusts the chemical feed rate has been developed for use with aeration basins. The foam probe system is controlled by a sensing electrode that detects the level of foam by conductivity. The sensing electrode is installed in the foaming system at the maximum desired foam height. The foam probe system operates by feeding a small amount of antifoam continuously from a base load pump and additional antifoam from an automatically controlled surge pump. The surge pump is activated only when foam touches the foam sensing electrode. (Sandoski-FIRL)
W76-08249

'WE'VE FOUND A REAL TIME-SAVER',
Mansfield Sewage Treatment Plant, Ohio.
For primary bibliographic entry see Field 8C.
W76-08251

DERIVATION OF A MODEL RAIN FOR THE DIMENSIONING OF SEWER SYSTEMS (ENTWICKLUNG EINES BERECHNUNGSREGENS FUER DIE BEMESSUNG VON KANALNETZEN),
V. Sifalda.
Gas- und Wasserfach, Wasser/Abwasser, Vol. 114, No. 9, p 435-440, 1973. 3 fig, 4 tab, 7 ref.

Descriptors: *Model studies, *Rainfall, *Sewerage, Rainfall intensity, Design, Combined sewers, Precipitation(Atmospheric).
Identifiers: Czechoslavakia.

Model rainfall for the dimensioning of mixed sewer systems has been derived from time analyses of heavy rainfalls in Prague, Pilsen, and Brno to obtain the loading of the sewer system due to rainfall preceding the main period of precipitation. Rainfall with an initial peak period occurring within the first half of the total duration was predominant; rainfalls with uniform and non-uniform intensity distributions were found to be equal frequency. The rainfall profile, composed of three sections, includes: the initial rainfall period with 25 percentof the average intensity of the precipitation period and of the same duration as the latter; a second phase of the precipitation period; and, a final rainfall period. (Nave-FIRL)
W76-08253

TOWN HALTS INFILTRATION.
Water and Wastes Engineering, Vol. 10, No. 10, p 47, October, 1973.

Descriptors: *Sewerage, *Infiltration, Groundwater, Manholes, Repairing, Treatment facilities, Design criteria, Cements, Joints(Connections), Pipelines, Hydraulics, Georgia.
Identifiers: St. Simons Island(Ga), Hydraulic loading, Sewer repair.

Renovation of sewer lines and manholes cut infiltration 1.1 mgd at peak loading in a Georgia community. In early 1971, the sewage treatment at St. Simons Island was being subjected to peak loadings of more than two mgd by groundwater infiltration through leaking collector lines and deteriorated manholes and catch basins. Work was begun in March 1971 with Southern Line crews assigned to clean, televise, and repair more than six miles of sewage collection lines and renovate 62 deteriorated manholes, the latter accomplished by the use of special cement formulas and techniques developed by Southern Line research. Since project completion, hydraulic loading on the treatment facility has diminished from peak values of over two million gpd to values peaking at 900,000 gpd. Also, sand infiltration has noticeably been decreased as indicated by grit chamber loading. According to current design criteria, an additional 2000 customers can be added to yield a maximum loading hydraulically of 1.5 mgd. This would mean a prospect of doubling the present loading which could result in a minimum increase in revenue of $9500 per month in accord with their present rate structure. (Sandoski-FIRL)
W76-08257

APPARATUS FOR FLUSHING SEWERS,
A. A. Lemke.
Canadian Patent 934,636. Issued October 2, 1973. Patent Office Record, Vol. 101, No. 40, p 3217, October 2, 1973.

Descriptors: Equipment, *Sewers, Manholes, Flow, Sewerage, *Patents, Outlets, Solid wastes, Tanks, *Waste water treatment.
Identifiers: Sewage accumulation tank.

A method and the equipment to create a periodic flow of aqueous wastes which will eliminate any settled solids accumulated from sewers and manholes has been patented. The system consists of a sewage accumulation tank positioned in a manhole which communicates with its liquid sump at a level below that of the outlet sewer conduit. The tank is adapted with vacuum means to induce the flow of sewage into the accumulation tank and with means to introduce air into the tank which will eliminate the vacuum and release the accumulated sewage rapidly to join with the normal sewage flow. This will produce a flushing surge of liquid flowing in the sewer condut. (Sandoski-FIRL)
W76-08262

SEWAGE CLEANED WITH COAL,
Materials Reclamation Weekly, Vol. 123, No. 11, p 21, September 15, 1973.

Descriptors: *Sewage treatment, *Coals, Heavy metals, Sewage, Lead, Zinc, Copper, Chromium, Cadmium, Mercury, Toxicity, *Canada, *Waste water treatment.
Identifiers: *Heavy metal removal.

A method of removing toxic heavy metals from sewage by using coal is being developed at the University of British Columbia in Canada. In this system, sewage passes over a bed of low-grade lignite coal which attracts heavy metals such as lead, zinc, copper, chromium, cadmium, and mercury. Almost 100 percent clearance of these metals has been achieved. It is estimated that the whole sewage flow of Iona Island, Vancouver, 70 mgd, could be treated with coal. This would require 700 tons of low grade coal crushed into 1/4-inch particles and spread in an 8-inch thick bed over an area of more than an acre. Such a bed could be used efficiently for at least 200 days. Its cleaning properties could then be restored by washing with a weak solution of nitric acid to dissolve the metals attracted by the coal. (Sandoski-FIRL)
W76-08263

NEW AUTOMATION IMPROVES SACRAMENTO WASTEWATER CONTROL,
Instrumentation, Vol. 26, No. 2, p 7-11, 1973. 3 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Automatic control, Filters, Control systems, Equipment, Sludge treatment, Clarification, California, Automation.
Identifiers: Sludge handling, Clarifiers, Sacramento(Calif).

Recent expansion of the Sacramento, California, main waste water treatment facility included the addition of a secondary stage. Improvements consisted of increased headworks capacity, biological filters, secondary clarifiers, and the latest types of automatic control instrumentation. New instrumentation includes Vutronik solid-state electric miniature indicator controllers in the sludge-handling control room and Vutronik recorders in the main control room. All instrumentation was furnished by Honeywell under a subcontract for supervision services during installation and commissioning of the control systems. (Sandoski-FIRL)
W76-08264

EMERGENCY EQUIPMENT UTILIZATION KEEPS EFFLUENT CLEAN,
Water and Sewage Works, Vol. 120, No. 9, p 120-121, 4 fig. September 1973.

Descriptors: *Treatment facilities, *Waste water treatment, *Activated sludge, Biochemical oxygen demand, Sludge, Effluents, Florida, Electrical equipment.
Identifiers: Pensacola(Fla), Emergency equipment, Caterpillar natural-gas engine.

The City of Pensacola, Florida, has developed an emergency system to eliminate problems in the case of power failure or equipment downtime. Under the jurisdiction of the Sewage Treatment Division are five treatment plants and 63 pumping stations scattered around the franchised area. These five plants have a total capacity of 110.5 mgd. At the Central Plant, which treats about 9.0 mgd of the total volume, treatment is by the activated sludge method which yields a better than 90 percent reduction in BOD. Primary power for each of the three 10,000 cfm mechanical blowers is a Caterpillar natural-gas engine. At full plant capacity, something less than two of these engines are necessary for complete treatment. Pensacola installed three engines; one of which is always on standby. In addition, two 5000cfm electric blowers were installed. To keep necessary electric gear

functioning in case of an outage, a 190 kw Caterpillar standby generator was installed with the natural gas engines. The total effect of the treatment process has been to reduce BOD by at least 90 percent from an input strength of between 200 and 360 mg/liter, making the effluent to Pensacola Bay within safe limits. Also, the solids content of the input waste, about 0.1 percent, has been separated and concentrated to the three percent level of the digested sludge. (Sandoski-FIRL)
W76-08265

ZERO EFFLUENT SYSTEM.
Products Finishing, Vol. 37, No. 9, p 129, June, 1973. 1 fig.

Descriptors: *Industrial wastes, *Waste water treatment, *Automatic control, Liquid wastes, Solid wastes, Sludge treatment, Landfills, Centrifugation, Clarification, Control systems, Illinois.
Identifiers: Rock Island Arsenal(Ill), Plating wastes, Zero discharge.

Plating wastes from Rock Island Arsenal, Illinois, are treated in a closed-loop totally automatic system designed by the Arsenal and DMP Corporation of Charlotte, North Carolina. All liquid and solid wastes are reclaimed, reducing water consumption by 54,000 gallons per year and water cost from 45 to 30 cents per 1000 gallons. The system processes 225,000 gallons per day, with zero discharge. Sludge from the clarifier is centrifuged, solids are calcined, and ash is used for landfill. All phases of the system are automatically controlled, with alarms sounding when operational parameters are violated. (Sandoski-FIRL)
W76-08267

EFFICIENT CHEMICAL METHOD FOR THE TREATMENT OF ZINC MANUFACTURING PLANT GENERATED WASTE WATERS (EFFEKTIVNYY KHIMICHESKIKH SPOSOB OCHISTKI STOCHNYKH VOD TSINKOVOGO ZAVODA),
V. A. Sedova, and B. I. Kogan.
Tsvetnyye Metally, No. 4, p 53-54, 1973. 1 tab.

Descriptors: *Industrial wastes, *Effluents, Lime, Calcium chloride, Chlorine, *Zinc, Cadmium, *Waste water treatment.
Identifiers: Chemical treatment, Metal removal.

A chemical process for the removal of zinc and cadmium from zinc smeltery generated effluents was tested in scale-up experiments. In the first stage of treatment, the effluent was treated with slaked lime (210 gallons/liter) to adjust the pH value to 9-9.5, and then settled for two hours. The water from the first stage was decanted into a second stage reactor in which, under intense agitation, it was subsequently treated with calcium chloride solution (500/g/liter) and soda ash solution (100/g/liter) and then settled for four hours for the coprecipitation of zinc, cadmium, and calcium carbonate. While this treatment procedure entails increased mineral and chlorine ion contents in the treated water, the latter can be recycled within the manufacturing process provided the use of calcium chloride is not necessary. This method has proved efficient in the removal of manganese, iron, lead, strontium, and in part, of aluminum, silicon, and titanium from the effluents. (Takacs-FIRL)
W76-08268

CHEMFIX TREATMENT SYSTEM FOR LIQUID AND SLUDGE EFFLUENTS.
Materials Reclamation Weekly, Vol. 122, No. 20, p 26, May 19, 1973.

Descriptors: *Industrial wastes, *Sludge, Waste water treatment, Sludge treatment, Heavy metals, Lagoons, Storage tanks, Toxicity, Steel, Chemical industry.
Identifiers: Chemical reagents, Steel industry, Metal finishing industry.

A process for transforming certain industrial toxic liquid and sludge wastes into a harmless, soil-like substance which can be returned to the land, has been developed under the name of Chemfix. At its present development stage, Chemfix is limited to wastes with a high inorganic content. Each type of waste needs careful analysis to determine if it is suitable for treatment. Among areas for which the process is strongly applicable are sections of the steel, metal finishing, and chemical industries giving rise to liquids and sludges with heavy metal concentrations. In this process, wastes are pumped from lagoons or storage tanks into a Chemfix mobile processing plant housed in a 40-foot road trailer. Chemical reagents are introduced to the waste which is then pumped from the plant to settle on the ground. Within one to three days the treated sludge becomes an inert, earth-like solid, which is nontoxic and non-polluting. (Sandoski-FIRL)
W76-08269

WASTE WATER RECYCLED FOR USE IN REFINERY COOLING TOWERS,
Mobil Oil Corp., East Chicago, Ind.
J. A. Hart.
Oil and Gas Journal, Vol. 71, No. 4, p 92-96, June 11, 1973. 3 fig, 3 tab.

Descriptors: *Waste water treatment, *Water reuse, Flotation, *Cooling towers, Pollution abatement, Effluents, Lake Michigan, *Recycling, Organic compounds.
Identifiers: Refineries.

Mobil Oil Corporation's East Chicago, Indiana, refinery has been reusing water in various ways for more than 30 years. Water supply for the refinery is taken from the Indiana Harbor Canal which flows into lower Lake Michigan. Although quality of this water is rather poor, it is the only source of input water at this refinery. Sulfides and ammonia are removed from process waste water in a sour water stripper. A dissolved air-flotation unit removes oil and suspended solids. Treated waste water is then reused for cooling tower makeup while cooling tower blowdown is used for pump-gland cooling systems. Stripped sour water is reused as crude-desalter wash water. Water contamination has been minimized and pollutants discharged to the Indiana Harbor Canal have been reduced. Several new sources of waste water for reuse have been developed. Six minor refinery-effluent discharge streams were eliminated, leaving only one process water outfall. Ballast water is piped into two 10,000 bbl holding tanks; the oily water is discharged continuously into the API separator and air-flotation units thus becoming a part of the waste water used as cooling tower makeup. A permanent well point system is operated adjacent the dock bulkhead to maintain groundwater at a level slightly below canal water level and to prevent hydraulic damage to the bulkhead. (Sandoski-FIRL)
W76-08270

CYANIDE TREATMENT IN THE METAL FINISHING INDUSTRY,
K. R. Coulter.
Canadian Mining Journal, Vol. 94, No. 6, p 33-34, June, 1973.

Descriptors: *Industrial wastes, Oxidation, Carbonates, Nitrogen compounds, Suspended solids, Filtration, Iron, Calcium, *Waste water treatment.
Identifiers: *Cyanide, Catalytic oxidation, Carbon copper, *Metal finishing wastes.

A new process for cyanide treatment in the metal finishing industry is catalytic oxidation with carbon copper. The Calgon company produces and is marketing equipment in which Cu is introduced as a catalyst and mixed with the cyanide waste stream. This mixture is then passed through an oxygen bearing gas which after mixing is passed through a carbon tower. The ratio of CN (-) to O2 to Cu is 1:1:1 by weight in the solution and complete destruction to carbonate and nitrogen compounds occurs in about 25 minutes. A piece of equipment for treating about 50 gpm, costs $25,000 and can be prepared to engineering specifics. Limitations are that Fe and Ca will interfere and suspended solids above 50 ppm must first be filtered out. (Sandoski-FIRL)
W76-08271

CANADIAN MILLING PRACTICE FOR WATER RE-USE,
Department of Energy, Mines and Resources, Ottawa (Ontario). Mineral Processing Div.
D. E. Pickett.
Canadian Mining Journal, Vol. 94, No. 6, p 29-30, June, 1973. 1 tab.

Descriptors: *Water reuse, *Surveys, Mine wastes, Mining, Suspended solids, Overflow, Flotation, Mills, *Canada, Reviews, Industrial wastes, Gold, Zinc, Copper, *Recycling, *Waste water treatment.
Identifiers: Environmental protection, Colloidal slimes.

A survey of water recycling practices in Canadian mills gathered facts from which research requirements could be planned, informed mill superintendents of practices at other plants, and presented a picture of the efforts and progress of the industry in meeting environmental protection demands. Of seven gold mines reporting, four indicated no recycling. Operating conventional cyanide circuits with zinc precipitation, all recycle some barren solution if only to conserve cyanide. In 85 percent of the copper tonnage, an average of 76 percent of the water is recycled. Scarce water at many copper mine sites is a big factor but other plants utilizing fresh water also recycle successfully. Except for two of the mine mills reporting, nickel-copper mills recycle all water used. The other mills reclaim water from a controlled lake system with no release to the natural surface-water system. Advantages claimed are possible reagent and heat savings. Problems are caused by suspended solids, particularly in thickener overflow water, pump glands, and heat exchangers. Hardness and colloidal slimes cause flotation control problems mainly due to variability. Twenty-five percent of the iron mines, all concentrating magnetite, report: no problems at one, although hardness and low pH indicate a fairly high sulfate content; at a second, recycling from a thickener with only 110 minutes retention time, problems with suspended solids and colloidal material requiring lime and flocculant; and, of a third mine, recycling from a single large pond with 70 days retention, no suspended solids or pipeline problems. (Sandoski-FIRL)
W76-08272

A NEW SEWAGE TREATMENT TECHNIQUE FOR THE PURPOSE OF NITROGEN ELIMINATION (I): BIOLOGICAL DENITROGENIZATION OF URBAN SEWAGE (CHISSO JOKYO O MOKUTEKI TO SHITE ATARASHII GESUI SHORI GIJUTSU (I),--TOSHI GESUI KARA NO SEIBUTSUGAKUTEKI DATSU CHISSOHO NI TSUITE),
Ebara Infilco, Tokyo (Japan).
Y. Toya, Y. Matsuo, and T. Suzuki.
Yosui to Haisui, (Water and Waste) Vol. 15, No. 9, p 26-42, September, 1973. 12 fig, 2 tab, 26 ref.

Descriptors: *Sewage, *Biological treatment, *Denitrification, Nitrogen, Pilot plants, Laboratory tests, Sewage treatment, Municipal wastes, Tanks, Organic matter, *Waste water treatment.
Identifiers: Nitrogen removal.

Various methods of biological denitrification of urban sewage were investigated by laboratory experiments and a pilot plant study between

November 1971 and February 1973. Application of the treatment to urban sewage was firmly and clearly demonstrated. The Wuhrmann method, the Bringmann method, and the new process developed by Ludzack and Ettinger were examined. Results indicate that the Bringmann method leaves some untreated NH and N in sewage. Therefore, the mixed liquid in the nitrification tank was fed to the first denitrification tank where sewage was contacted and completely denitrified. The liquid then was fed into the nitrification tank and remaining NH3-N oxidized. Finally the liquid passed into the secondary denitrification tank where the Wuhrmann method was applied. The elimination rate of nitrogen was found to be more than 90 percent without a methanol additive. This new method appears particularly effective in the treatment of organic wastes. (Seigle-FIRL)
W76-08274

A CONTINUOUS METHOD OF MONITORING WATER QUALITY BY CHLORINE CONSUMPTION UNDER ULTRAVIOLET RADIATION. I. DESIGN AND PERFORMANCE TEST OF CONTINUOUS CHLORINE CONSUMPTION METER AND APPLICATION TO RAW WATERS OF A WATER PURIFICATION PLANT, (IN JAPANESE),
For primary bibliographic entry see Field 5A.
W76-08276

A THEORETICAL STUDY OF FACTORS INFLUENCING THE MICROBIAL POPULATION DYNAMICS OF THE ACTIVATED-SLUDGE PROCESS-II. A COMPUTER-SIMULATION STUDY TO COMPARE TWO METHODS OF PLANT OPERATION,
Water Pollution Research Laboratory, Stevenage (England).
C. R. Curds.
Water Research, Vol. 7, No. 10, p 1439-1452, 1973. 9 fig, 1 tab, 2 ref.

Descriptors: *Model studies, *Treatment facilities, Computer models, Sludge, Sewage, Effluents, Bacteria, *Activated sludge, Microorganisms, *Waste water treatment, Suspended solids.
Identifiers: Debris, Population dynamics.

Computer simulations were performed to investigate the effects of operating a plant with a constant sludge-wastage rate and with a constant concentration of mixed-liquor solids. Theoretically, if any sewage parameter is not completely stable, then a slightly better quality effluent should be achieved when the plant is operated with a constant specific wastage rate. In practice, however, the slight improvement is not usually measurable. The effects of a sudden stable increase (a slug dose) of sewage substrate and bacterial content on the plants operated in the two ways studies have been simulated; diurnal variations in sewage flow, and in concentrations of bacteria, debris, and substrate in the sewage were considered. (See also W74-02996) (Sandoski-FIRL)
W76-08277

DEVELOPMENT OF ASSYMMETRIC CELLULOSE TRIACETATE MEMBRANES FOR SEAWATER DESALINATION,
Universal Oil Products Co., San Diego, Calif. Fluid Systems Div.
For primary bibliographic entry see Field 3A.
W76-08283

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS SEA WATER DESALTING PLANTS, DESIGN OF 1-10 MGD SEAWATER PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08284

MORRELL PIONEERS MORE EFFICIENT AERATION,
John Morrell and Co., Ottumwa, Iowa.
G. E. Ahrens.
Reprint, Food Engineering, August 1969. 3 p, 1 fig.

Descriptors: *Food Processing Industry, *Waste water treatment, *Activated sludge, Iowa, Industrial wastes, *Oxidation lagoons, *Design, *Operations, *Treatment facilities, Performance.
Identifiers: *Meat packing wastes, *Oxidation ditch.

The design and proposed operation of a 3.25 mgd channel aeration activated sludge wastewater treatment plant are described. The plant is designed to treat hog and beef meat packing wastes from the John Morrell and Co. plant in Ottumwa, Iowa. Design details, unit sizes and features are described and predicted performance is summarized. (EPA-Corvallis)
W76-08286

THE INFLUENCE OF SOILS AND PLANT COVER ON THE RETENTION AND UTILIZATION OF SUSPENDED AND DISSOLVED MATERIALS IN THE WASTE WATER OF A POULTRY PROCESSING PLANT,
Clemson Univ., S. C. Dept. of Agricultural Chemical Services.
N. R. Page.
August 1971. 21 p, 1 fig, 5 tab.

Descriptors: *Food Processing Industry, *Waste water treatment, Return flow, Soil analysis, Agriculture, Agronomy, Industrial wastes, Poultry, Soil chemical analysis.
Identifiers: *Poultry processing industry, Spray irrigation.

Poultry processing plant effluent is characterized with respect to chemical elements prior to spray irrigation, the chemical composition of ground cover (reed canarygrass) is determined, and the soil is characterized. The wastewater is applied at the rate of 3.6 million gallons per 100 acres. It was analyzed for K, Ca, Mg, Na, N, NO3, P, S, Cl, and pH. Sodium concentration (105 mg/l) is double that of the next highest element, nitrogen. Source of Na is blood and detergents; the nitrogen exists mainly in the organic form (suspended animal matter). For the reed canarygrass composition, the N and P concentrations were nearly double the published values, thus making the canarygrass a good food source. Removals from the wastewater by plant uptake ranged from 25 percent for K to 0.5 percent for Na. Soil analysis found that the system increased the organic matter, cation exchange capacity, and Ca, K, Na, S and P concentrations, and decreased the Mg concentration within the 0-4 foot depth of the soil. Most of the Na, Cl, and nitrates leach into the groundwater. P and S added at the present rate can be fixed and/or absorbed by the soil for a 50 year period. (EPA-Corvallis)
W76-08287

NEW APPROACHES POINT TO BETTER ECONOMIES IN HIDE PROCESSING,
For primary bibliographic entry see Field 3E.
W76-08288

COAGULATION WITH CHITOSAN - AN AID TO RECOVERY OF BY-PRODUCTS FROM EGG BREAKING WASTES,
Georgia Univ., Experiment. Div. of Food Sciences.
W. A. Bough.
(1975). 21 p, 8 tab, 16 ref.

Descriptors: *Food processing industry, *Coagulation, Flocculation, Flotation, Polymers, By-product, Amino acids, Waste water treatment, Poultry, Industrial wastes.
Identifiers: *Egg Products Plant, Coagulant aids, *Chitosan, Dissolved Air Flotation.

Egg breaking wastes were treated with 100-200 mg/l chitosan, a by-product derived from shrimp and crab shells, and 2-20 mg/l Betz 1130. Suspended solids in the wastewater were reduced by 70-90% and the COD by 55-75%. The yield of dry coagulated solids from wastes collected during cleanup was approximately 12 lb./1000 gal., and from the concentrated wastes in the egg washers, the yield was approximately 40 lb./1000 gal. The estimated polymer cost for coagulation of the egg washer wastes was $0.80/1000 gallons. The amino acid composition of five samples of coagulated egg by-products approximated closely the composition of whole eggs. The value of the coagulated solids and the savings in waste treatment charges may encourage segregation and treatment of concentrated egg breaking wastes. (EPA-Corvallis)
W76-08289

BIOLOGICAL CHANGES IN THE SOUTH ST. PAUL SEWAGE TREATMENT PLANT BEFORE AND AFTER TREATMENT WITH FECL3 AND NALCOLYTE 675 COAGULATING AGENTS,
Saint Cloud State Coll., Minn. Dept. of Biology.
K. M. Knutson.
September 10, 1970. 23 p, 3 fig, 4 tab, 4 ref, 11 plates.

Descriptors: *Food processing industry, Waste water treatment, *Coagulation, Flocculation, Trickling filters, Anaerobic digestion, Polyelectrolytes, *Microorganisms, Algae, Bacteria, Oxidation lagoons, Industrial wastes, Minnesota, Eutrophication, Settling basins, *Sewage treatment.
Identifiers: *Meat-packing wastes.

Results are presented of analyses of trickling filter microorganisms anaerobic stabilization pond bacteria, and anaerobic stabilization pond algae at the South St. Paul sewage treatment plant before and after primary treatment with FeCl3 and Nalcolyte 675 coagulating agents. The plant treated combined municipal and slaughterhouse wastes. For the trickling filter, no significant change was found in the association of species with respect to number of species and dominance. Each species did appear in greater quantity after treatment. For the anaerobic stabilization pond, the number of bacteria increased after treatment by a factor of 5 to 18 depending on sample location. This increase was considered beneficial. For the anaerobic stabilization pond, algae fluctuations were considered minor and represented only a 1.7 fold increase after treatment. One period did show an algal bloom which resulted in a 140 fold increase. A possible cause was the cessation of slaughtering operations by Swift and Co. resulting in a lower BOD, thus stimulating algal growth. The increased growth of microorganisms, algae, and bacteria is beneficial and hastens the utilization and decomposition of non-refractory organic matter. (EPA-Corvallis)
W76-08290

WASTEWATER CONTROL AT EGG PRODUCTS PLANTS, PT. 1-3.
Poultry and Egg Inst. of America, Washington, D.C.
For primary bibliographic entry see Field 3E.
W76-08291

WASTES FROM THE POULTRY PROCESSING INDUSTRY,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 3E.
W76-08292

DESIGN AND PERFORMANCE OF PHYSICAL-CHEMICAL AND ACTIVATED SLUDGE TREATMENT FOR AN EDIBLE OIL PLANT,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.

C. E. Adams, J. J. Joseph, T. Walsh, and R. M. Stein.
Presented at 30th Annual Purdue Industrial Waste Conference Purdue University, West Lafayette, IN, May 6-8, 1975. 20 p, 7 fig, 5 tab.

Descriptors: *Food processing industry, *Waste water treatment, Separation techniques, Flotation, Oxidation lagoons, Aerobic treatment, Aeration, *Activated sludge, Design data, Industrial wastes, Design, Performance, Oil wastes.
Identifiers: *Edible oil refinery, API separator, Dissolved air flotation.

A waste treatment system was designed and constructed for an edible oil (vegetable) refinery and an in-plant waste management program was developed. Pilot-scale activated sludge studies were performed in order to obtain design parameters for the secondary system. The reaction rate coefficient, k, was determined to be 0.0074, the oxygen utilization rate, a', was 0.52, and the endogenous utilization rate, b', was 0.34. The total treatment system consisted of pH adjustment, API separator, equalization tank, dissolved air flotation (DAF), aerated lagoon, activated sludge, and a final clarifier. Results of full-scale operation indicated a BOD5 of 5000 mg/l in the raw wastewater was reduced to 12 mg/l in the final effluent. Oil and grease levels were reduced from a raw wastewater concentration of 2515 mg/l to 10 mg/l. (EPA-Corvallis)
W76-08293

COMBINED TREATMENT OF LEATHER TANNING AND MUNICIPAL WASTES AT GRAND HAVEN, MICHIGAN,
Prein and Newhof, Consulting Engineers, Grand Rapids, Mich.
C. V. Huber, and G. E. Jones.
Presented at 29th Annual Purdue Industrial Waste Conference, May 9, 1974. Purdue University, West Lafayette, Indiana. 20 p, 4 fig, 2 tab.

Descriptors: *Tannery wastes, *Waste water treatment, Waste treatment, *Activated sludge, Michigan, Municipal wastes, Industrial wastes, Pre-treatment(Water), *Aeration, Construction costs, Treatment facilities.
Identifiers: Pretreatment(Wastes), Combined treatment.

Design and construction are described of combined treatment for municipal and leather tanning wastes in which the tannery contributed 20 percent of the flow and 90-95 percent of the BOD and suspended solids. Major design considerations were: (1) Transportation of tannery waste, (2) Selection of method of treatment, (3) Protection of secondary treatment processes, (4) Solids dewatering and disposal, and (5) Odor control. Pretreatment facilities constructed at the tannery included screening for the hide and beamhouse wastewaters prior to combining with the rest of the tannery flow which enters an equalization tank. Processes chosen to the plant degign were : (1) Comminution and grit removal for the municipal wastewater, (2) aerated quick-mix tank for the blending and addition of chemicals to the combined municipal-tannery wastewater flow, (3) primary clarification of the combined wastewater flow, (4) activated sludge aeration system, (5) final clarification, and (6) chlorination. The total construction cost was $4.2 million with operation and maintenance cost estimated at $46 per million liters ($175 per million gallons) for domestic waste and $137 per million liters ($520 per million gallons) for the tannery waste. (EPA - Corvallis)
W76-08294

TRIVALENT CHROMIUM IN TANNERY EFFLUENTS,
Instituut TNO Leder en Schoenen, Waalwijk (Netherlands).
A. J. J. Van Meer.
September 1973. 8 p, 8 ref.

Descriptors: *Tannery wastes, *Toxicity, Chromium, Sludge, Disposal, Effluents, Industrial wastes, *Waste water treatment, Waste disposal.
Identifiers: *Chromium removal.

The pollution potential of chromium in tannery effluents is reviewed. Four areas covered are: (1) tanning with chromium salts, (2) amounts of trivalent chromium (Cr3+) discharged and general precautions which can reduce these amounts, (3) toxicity of tri-valent chromium in wastewaters, and (4) tri-valent chromium in the sludge of sewage works. Conclusions were: (1) Tannery effluents do not contain Cr6+, (2) A difference must be made between Cr6+ and Cr3+ and also between soluble and insoluble Cr3+ compounds when setting effluent limitations, (3) Method of sludge disposal must be considered when regulatory agencies establish a tolerance level for Cr3+, (4) Within certain limits the amounts of Cr3+ discharged per day may be more important than the concentration. (EPA-Corvallis)
W76-08295

CHANGING HOG HAIR FROM COSTLY NUISANCE TO ASSET.
Penn Packing Co., Philadelphia, Pa.
The National Provisioner, April 6, 1974, p. 10-14.

Descriptors: *Food processing industry, *By-products, Hogs, Industrial wastes, Protein, Hydrolysis, Chemical degradation, Costs, *Waste water treatment, Water pollution control, *Digestion.
Identifiers: *Hog processing wastes, *Hair hydrolyzer, Waste reduction.

A hog hair hydrolyzer was installed to eliminate the necessity of disposing the hair on landfill. A high quality digestible protein is produced. As a finished meal the product had average protein and pepsin digestibility percentage ratings of 90 and 77, respectively. On a wet basis protein percentage ratings averaged 55. Processing of toenails produced a finished meal with a 91 percent protein rating and a 81 percent digestibility rating. Crude fiber ranged from 0.67 to 0.3 percent. Actual cost figures have not been determined, but the hydrolyzing system gives a favorable payback period and the company no longer has to pay to have the hair hauled away. (EPA - Corvallis)
W76-08297

RECYCLING OF WATER IN POULTRY PROCESSING PLANTS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 3E.
W76-08298

USE, CONTINUED USE, AND REUSE OF BOTH PROCESS AND WASTE WATERS IN POULTRY PROCESSING OPERATIONS,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 3E.
W76-08299

ECONOMICS OF IN-PLANT WASTE MANAGEMENT IN FOOD PROCESSING,
Economic Research Service, Washington, D. C. Natural Resource Economics Div.
For primary bibliographic entry see Field 3E.
W76-08300

FOOD HABIT OF VORTICELLIDAE ISOLATED FROM ACTIVATED SLUDGE,
Tokyo Univ. (Japan). Inst. of Applied Microbiology.
R. Sudo, and S. Aiba.
Jap J Ecol. 21(3/4), p 140-146, 1971.

Descriptors: Activated sludge, Sewage treatment, Biological treatment, Waste water treatment, *Bacteria, Isolation, Water purification.
Identifiers: Vorticella-Alba, Vorticella-Convallaria, Vorticella-Microstoma, *Vorticellidae.

To determine the food habits of 3 spp. of Vorticellidae (V. microstoma, V. convallaria, V. alba) which are significant in purifying waters polluted by activated sludge, pure cultures of several strains of bacteria which were expected to be in the sludge were prepared. Some of the bacteria could be metabolized by Vorticellidae. If a mixed diet of the bacteria favorable for protozoan growth was given, the specific growth rate of Vorticellidae approached that value which occurred when the heterogeneous bacteria isolated from the sludge were given in situ. V. microstoma did not proliferate in the sludge extract medium when the favorable bacteria as food were inactivated by antibiotics and no growth of the protozoa was noted when sterile rice-bran, boiled egg yolk or sterilized suspended solid from raw sewage was given as food. Vorticellidae were presumed to take only the bacteria and were stenophagic and holozoic. The relationship demonstrated between the microflora and microfauna in the sludge may lead to the biochemical and microbiological control of the biotic community in the activated sludge process.--Copyright 1976, Biological Abstracts, Inc.
W76-08309

INTRODUCTION TO HYDROBIOLOGY. HYDROBIOLOGY: A COMPENDIUM FOR ENGINEERS AND NATURAL SCIENTISTS, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-08315

DETERMINATION OF BIOLOGICAL DEGRADABILITY OF ORGANIC SUBSTANCES,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
For primary bibliographic entry see Field 5B.
W76-08351

EFFECTS OF GRAZING ON INFILTRATION RATES IN WASTE WATER SPRAY FIELDS,
West Virginia Univ., Morgantown. Div. of Plant Sciences.
For primary bibliographic entry see Field 5E.
W76-08352

WATER QUALITY CRITERIA FOR GREAT LAKES WATERS TO BE USED AS MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Canada Centre for Inland Waters, Burlington (Ontario).
D. H. Matheson.
Scientific Series No. 43, 1975. 50 p, 2 tab, 105 ref.

Descriptors: *Water quality standards, *Great Lakes, *Water purification, *Municipal water, *Potable water, Water quality, Public health, Aquatic life, Intakes, Wells, Aesthetics, Toxins, Water quality control, Bacteria, Viruses, Mineralogy, Water policy, Alaklinity, Dissolved oxygen, Chlorides, Sulfates, Fluorides, Bromine, Iodine, Dissolved solids, Ammonia, Arsenic compounds, Cadmium, Chromium, Cobalt, Copper, Iron, Manganese, Lead, Mercury, Nitrates, Nickel, Zinc, Asbestos, Organic matter, Odor, Activated carbon, Water supply.
Identifiers: Cyanide, Raw water criteria.

A frame of reference is based on practical problems and research needs of industry concerned with treatment and disposal of waste water and provision of adequately treated water for municipal use as related to the physical situation of the Great Lakes and interconnecting waterways. The history of the development of water quality standards is reviewed. Factors affecting the quality of raw waters (sewage treatment effluents, industrial wastes, urban street runoff, land drainage, dredging and spoil disposal, and movement of pol-

luted water) are discussed. Criteria for specific water quality parameters are discussed in connection with microbiology, viruses, mineral consitutents (total dissolved solids, pH, alkalinity, hardness, chlorides, sulfates), fluoride, bromine, iodine, dissolved oxygen, ammonia, arsenic, cadmium, chromium, cobalt, copper, cyanide, iron, manganese, lead, mercury, nitrates, nickel, zinc, asbestos, organic matter, and odor. Special attention is given to the question of organic matter in water--natural sources, treated sewage, and organics released by the chemical industry. Research is needed on every aspect of the supply-and-use cycle: effectiveness of waste treatment processes; effects of substances in treated wastes on the environment, especially intake water quality; and the effectiveness and efficiency of standard and advanced purification processes. (Buchanan-Davidson--Wisconsin)
W76-08363

THE KINETICS OF MICROBIAL NITRIFICATION,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
G. M. Wong-Chong, and R. C. Loehr.
Water Research, Vol. 9, No. 12, p. 1099-1106, 1975. 16 fig., 16 ref.

Descriptors: *Kinetics, *Microorganisms, *Nitrification, *Sewage treatment, Nitrogen, Nitrites, Hydrogen ion concentration, Temperature, Chemical reactions, Equations, Ammonification, Oxidation, Aerobic conditions, Ammonia, Waste water treatment.

The kinetics of the microbial reactions involved in the conversion of organic nitrogen to nitrate was examined. The type of reaction of each stage and the effects of the operating variables (microbial concentration, pH, and temperature) on these reaction rates were determined. The results were correlated into equations which defined the reaction sequence mathematically. The reaction sequence for aerobic conversion of organic nitrogen to nitrate consists of a first-order reaction for ammonification and zero order reactions for both nitrification processes. Nitrification rates were correlated as a function of a maximum oxidation rate, a reaction rate constant, and the responsible microbial mass, using acorrelation form similar to the Michaelis-Menten equation. Temperature and pH effects on oxidation rates were established with the maximum rates unaffected by temperature, and the reaction rate constants obeying Arrhenius' law. The pH for optimum oxidation is about 7.0-7.5. The information could be used to indirectly measure the nitrification population in treatment systems. When no inhibitors are present, the rate limiting step of the reaction sequence is the oxidation of ammonia. The applicability of the data to nitrogen removal systems containing highly nitrogenous wastes is discussed. (Buchanan-Davidson--Wisconsin)
W76-08369

COMMERCIAL MEMBRANE DESALTING PLANTS: DATA AND ANALYSIS,
DSS Engineers, Inc., Ft. Lauderdale, Florida.
For primary bibliographic entry see Field 3A.
W76-08370

FIELD EVALUATION TESTING OF REVERSE OSMOSIS HIGH PRESSURE PUMPS AND ENERGY RECOVERY TURBINES.
Catalytic, Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 3A.
W76-08372

DEVELCPMENT OF REVERSE OSMOSIS MEMBRANES AND SPIRAL DESIGN MODULES FOR DEMINERALIZATION OF BRACKISH WATERS AT LOW PRESSURES,
Gulf Environmental Systems Co., San Diego, Calif.
For primary bibliographic entry see Field 3A.
W76-08373

DEMAND BACTERICIDE FOR DISINFECTING WATER AND PROCESS OF PREPARATION,
Kansas State Univ. Research Foundation, Manhattan. (Assignee).
J. L. Lambert, and L. R. Fina.
U. S. Patent No. 3,923,665, 8 p, 3 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 319, December 2, 1975.

Descriptors: *Waste water treatment, *Patents, *Water treatment, Water quality control, Water pollution treatment, *Disinfection, *Water purification, *Bactericides, Anion exchange, Chemical reactions, Resins, Iodides, Ion exchange.

Complete bacterial sterilization of highly contaminated water can be achieved without introducing objectionable amounts of iodine into the water. A strong base anion exchange resin is reacted with triiodide ions to form a stable compound of extremely low dissociation in water. The association of the triiodide ions with the basic exchange sites (cationic groups) of the resin is such as to block the sites from normal ion exchange with ions in the solution. The process of preparing the demand bactericide is described wherein the resin-triiodide complex is washed with water until the wash water gives a negative test for oxidizing iodine. The resin preferably is a quaternary ammonium resin which is first reacted with an alkylating agent to eliminate residual amine groups. (Sinha-OEIS)
W76-08391

WATER FILTER ASSEMBLY,
For primary bibliographic entry see Field 8C.
W76-08392

METHOD FOR TREATING SEWAGE WATER,
Diamond Shamrock Corp., Cleveland, Ohio (Assignee).
R. W. Fenn III, and K. J. O'Leary.
U. S. Patent No. 3,943,044, 8 p, 3 fig, 1 tab, 14 ref; Official Gazette of the United States Patent Office, Vol 944, No 2, p 828, March 9, 1976.

Descriptors: *Patents, Waste water treatment, *Sewage treatment, Water pollution treatment, Water quality control, Water pollution control, *Electrolysis, Chemical reactions, Anodes, Bubbles.

An electrolytic apparatus and method for rapidly and efficiently removing the suspended solids from and disinfecting the sewage water effluent from both large scale and portable applications is described. The apparatus has a combination stirrer-disintegrator for converting the suspended solids to small particle size materials, disinfecting and solids conveying means comprising at least one pair of diaphragm-free electrodes including a closely-spaced cathode and a dimensionally stable anode and a source of aqueous alkali metalhalide solution, and effluent means for removing the sterilized, substantially solids-free water from the chamber. The in-situ electrolytic treatment provides sterilization and solids removal in one chamber or vessel. Bubble formation is developed by the dimensionally stable anodes causing rapid flotation of suspended solids to the surface and thus enables rapid removal of solids. (Sinha-OEIS)
W76-08394

PROCESS FOR PURIFICATION OF INDUSTRIAL WASTE WATERS FROM PERCHLORATES AND CHLORATES,
V. N. Korenkov, V. I. Romanenko, S. I. Kuznetsov, and J. V. Voronov.
U. S. Patent No. 3,943,055, 3 p, 3 ref; Offical Gazette of the United States Patent Office, Vol 944, No 2, p 831, March 9, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Domestic wastes, Water pollution treatment, Water quality control, Water pollution control, Water purification, Biochemistry, Biodegration, Anaerobic digestion, Microorganisms.
Identifiers: *Perchlorates, *Chlorates.

The process of this invention involves intermixing of industrial waste waters with household-communal waste waters with the subsequent biochemical reduction of perchlorates and chlorates contained in the waters under anaerobic conditions by means of a strain of the microorganism Vibrio dechloraticans Cuznesove B-1168 grown by way of successive inoculations on a liquid nutrient medium containing sources of carbon, nitrogen, and phosphorus under anaerobic conditions in the presence of a perchlorate as a donor of oxygen. The purified water is then separated. (Sinha - OEIS)
W76-08395

CATALYTIC FILTERING-INCINERATING PROCESS AND DEVICE FOR WASTE WATER,
Thiokol Corp., Newtown, Pa. (Assignee).
D. B. Davis, and W. N. Christensen.
U. S. Patent No. 3,944,487, 3 p, 4 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1362, March 16, 1976.

Descriptors: *Patents, *Waste water treatment, Water quality control, Water pollution control, *Water pollution treatment, *Oxidation, *Filtration, Catalysts, *Incineration.
Identifiers: Hypochlorite ions.

The process for removing pollutants from waste water uses a granular, porous, regenerative, catalytic material of oxides of at least one metal selected from nickel, cobalt, iron, iridium, and mixtures thereof formed by oxidizing these metals when placed within the pores of aluminas having openings from 80 to 1000 angstroms, or molecular sieves with channels having openings from 8 to 40 angstroms. The waste water which is prescreened to remove foreign objects such as razor blades, toothpaste tubes, wood, etc., and to which hypochlorite ions are added is flowed through at least one bed of this catalytic material. The catalytic materials filters out and entraps pollutants, while simultaneously catalyzing the decomposition of hypochlorite ions into oxygen atoms which oxidize the pollutants as the water flows through the bed. After a pre-determined time, oxidizing gas containing oxygen is flowed through the bed and incinerates the entrapped pollutants. The catalytic material catalyzes the incineration of these entrapped pollutants and regenerates itself by means of the oxidizing gas. This results in a more rapid removal of the pollutants and a greatly extended bed life. (Sinha-OEIS)
W76-08400

REMOVING HEAVY METAL IONS FROM WATER,
Department of Agriculture, Washington, D. C. Office of the Secretary. (Assignee).
J. M. Randall, E. Hautala, A. C. Waiss, Jr., and J. A. Kuhnle.
U.S. Patent No. 3,944,415, 4 p, 3 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1342, March 16, 1976.

Descriptors: *Waste water treatment, *Patents, Water quality control, *Water purification, *Chemical wastes, Water pollution control, *Water pollution treatment, Mercury, *Heavy metals, Bark, Wood wastes, Peanuts, Filtration, Ions.
Identifiers: Nut waste, Formaldehyde, *Peanut skins.

Peanut skins or other nut waste or tree bark is modified by reaction with formaldehyde. The reaction is conducted in an aqueous system under

acidic conditions. Peanut skins are mixed with about 10 parts of water containing about 0.5 to 1 percent of an acid such as sulphuric, hydrochloric or phosphoric. After the peanut skins have been mixed with the dilute acid, 15-20 percent (based on the weight of peanut skins) of formaldehyde is added. The mixture is stirred and then allowed to stand for 2-3 hours at 50-70 deg C. Following this standing period the liquid is separated from the modified skins, which are washed and dried. The formaldehyde-modified peanut skins are then formed into a bed and the water containing heavy metal ions are allowed to percolate through them. Or the modified skins may be placed in a column and contaminated water pumped through. Contact is effected and maintained for a period long enough for the heavy metal impurities to be absorbed by the modified peanut skins. (See also W76-08402) (Sinha - OEIS)
W76-08401

REMOVAL OF HEAVY METAL IONS FROM WASTEWATER,
Department of Agriculture, Washington, D. C. Office of the Secretary. (Assignee).
C. L. Swanson, R. E. Wing, and W. M. Doane.
U.S. Patent No. 3,947,354, 7 p, 8 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2452, March 30, 1976.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Water pollution treatment, Water quality control, Water pollution control, *Heavy metals, Separation techniques, Chemical reactions, Polymers, Polyelectrolytes.
Identifiers: Starch xanthate.

The method of removing heavy metal ions from aqueous solutions to levels which are below or very close to the most stringent limits comprises determining the amount of heavy metals ions in an aqueous solution, adding to the aqueous solutions a water-soluble cationic polymer and a water-soluble anionic polymer such as starch xanthate in amounts sufficient to form a cationic polymer-heavy metal ion-anionic polymer complex precipitate, and separating the precipitate from the supernatant. The water-soluble cationic polymer is present in the aqueous solution in amounts of from 1 to 2,000 times the weight of heavy metal ions. (See also W76-08401) (Sinha - OEIS)
W76-08402

METHOD AND APPARATUS FOR DRYING MOISTURE-CONTAINING SOLIDS, PARTICULARLY DOMESTIC REFUSE AND SLUDGE CAKES,
A. Osdor.
U.S. Patent No. 3,946,495, 12 p, 8 fig, 5 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2171, March 30, 1976.

Descriptors: *Patents, *Waste water treatment, *Sludge treatment, *Sewage treatment, Water pollution treatment, Sludge disposal, Incineration, Separation techniques, Water purification, Vapor compression distillation, Steam, Steam turbines, Condensation, Potable water, Distillation, Water reuse.

A method and apparatus are described for the production of solid fuel and steam by drying moisture-containing solids, such as refuse and sludge cakes, in a multistage heating zone by using the moisture-containing solids as the feed-water in a direct contact countercurrent flow pressurized boiler. After vaporizing the bulk of the moisture in the heating zone of the boiler, the solid residue is further dried in a multi-stage flashing zone. From the upper end of the heating zone is removed a nearly saturated steam including the water vapor evaporated from the moisture-contained solids by the heat of cooling of the introduced superheated steam. A portion of the removed steam equal to the vaporized moisture is heated and then directed to a turbine, generating all the power required to operate the system. The bulk of the removed steam equal to the introduced superheated steam is compressed, reheated and recycled through the heating zone. The dried solid is removed at the lower end of the flashing zone and is incinerated, and the recovered heat is utilized to supply the heat required for the drying, and to produce saturated steam for heating purposes, or superheated steam for power generation. In the latter case the heat of condensation of the turbine exhaust steam is utilized advantageously as a heat source in a distillation plant for fresh water production. (Sinha - OEIS)
W76-08404

PROCESS AND APPARATUS FOR RECOVERING CLEAN WATER FROM AQUEOUS WASTES,
Hanover Research Corp., East Hanover, N. J. (Assignee).
C. Greenfield, R. E. Casparian, and A. J. Bonanno.
U. S. Patent No. 3,947,327, 9 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2445, March 30, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, Water pollution control, Water pollution treatment, Water quality control, Industrial wastes, Scaling, Corrosion, Evaporation, Condensation, Evaporators, Desalination, Oil.

The apparatus and process described comprise a systematic arrangement of equipment and a series of steps for recovering clean water from aqueous wastes by evaporation while avoiding fouling and scaling as well as corrosion of evaporator tubes. Addition of an oil, preferably a volatile oil, to the aqueous waste feed results in the formation of a coating of the oil on the surfaces of the tubes, thereby preventing corrosion and fouling and build-up of scale deposits. Volatile oil that distills over is separated from the aqueous distillate by conventional means and may be recirculated. (Sinha - OEIS)
W76-08408

PROCESS OF PREPARING SEWAGE SLUDGE FOR DEWATERING,
Envirotech Corporation, Menlo Park, CA (Assignee).
P. J. Cardinal, Jr.
U. S. Patent No. 3,947,350, 5 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2451, March 30, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Water pollution control, Water quality control, *Tertiary treatment, *Sludge treatment, Dewatering, Carbon dioxide, Incineration, Chemical reactions.

The invention relates to the field of effective dewatering of sewage sludge by altering its chemical make up following phosphorous removal by lime precipitation in a tertiary sewage treating process. Sewage and lime sludge are prepared for dewatering by introducing a source of carbon dioxide into a raw sewage treating system subsequent to lime dosing to effect transformation of the hydroxide salts in the sludge to a carbonate form in which form subsequent dewatering and ultimate disposal of the sludge is greatly facilited. If gaseous carbon dioxide is introduced into the system, one suitable source is the gaseous products of combustion obtained when dewatered sludge is burned in a suitable furnace, such as an incinerator or a lime recalcining kiln. Alternatively, sulfuric acid or hydrochloric acid or other pH of the sludge. Conversion of the sludge to the carbonate form is effected in conjunction with the production of carbon dioxide during the neutralization reaction effected by the chemical reactants introduced into the system. Desirably, the carbon dioxide is utilized in the system in a molar ratio of approximately 1 to 1 with the calcium hydroxide dosed into the system. (Sinha - OEIS)
W76-08409

WATER AND WASTE MANAGEMENT IN POULTRY PROCESSING,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 3E.
W76-08428

THE CONTROL OF CHLORIDE IONS IN THE MGO RECOVERY SYSTEM,
Babcock and Wilcox Co., Alliance, Ohio. Research and Development Center.
R. A. McIlroy.
Tappi, Vol. 56, No. 9, p 79-82, September, 1973. 1 fig, 4 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Corrosion, *Chlorides, Ions, Sulfite liquors, *Pulp wastes, *Corrosion control.
Identifiers: Magnesium oxide recovery.

A control system has been designed for the MgO recovery process which can greatly reduce corrosion by maintaining a low chloride ion level. The basis of the system is that chlorides leave the recovery boiler as HCl and can be readily removed from the flue gas by a venturi absorber. Process and economic studies have demonstrated that it is better to treat the absorber effluent to recover the MgO and SO2 which also are removed from the flue gas by the HCl absorber than to attempt prior treatment to prevent their removal. More than 95% of the chloride will be removed while the MgO loss can be held to an acceptable level. A conceptual design has been developed to combine the chloride ion control system with the MgO recovery system. (Sandoski-FIRL)
W76-08457

TOXIC CONSTITUENTS IN PULP MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5A.
W76-08458

METHOD AND APPARATUS FOR THE DESTRUCTIVE DECOMPOSITION OF ORGANIC WASTES WITHOUT AIR POLLUTION AND WITH RECOVERY OF CHEMICAL BYPRODUCTS,
California Univ., Berkeley. (Assignee).
D. L. Brink, and J. F. Thomas.
United States Patent 3,761,568. Issued September 25, 1973. Official Gazette of the United States Patent Office, Vol. 914, No. 4, p 1431, September 25, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Organic wastes, *Patents, Water vapor, Oxygen, Air pollution, *Pulp wastes.
Identifiers: *Pyrolysis, Kraft black liquor, Secondary pollution prevention.

A method for the destructive distillation and pyrolysis of organic material such as kraft black liquor has been patented. The material is held at elevated temperatures for a time sufficient to break down the material to non-combustible solids and a stable, clear-burning gaseous fuel. The temperature during pyrolysis is maintained at a level and for a time sufficient to prevent the recombination of intermediate products to compounds which would cause air pollution. A controlled amount of oxygen, which can take the form of malodorous emission gases such as those formed in the operation of a kraft mill or other industrial plant, is continuously introduced during pyrolysis to provide energy by exothermic oxidative reactions. The amount of oxygen introduced is insufficient to ef-

fect complete combustion of the reaction mixture. The water vapor content in the pyrolysis zone where cracking occurs is maintained at a level high enough to insure that carbon particles in the zone will react with water to form hydrogen and carbon monoxide. (Sandoski-FIRL)
W76-08459

FOAM DETOXIFICATION OF BLEACHED KRAFT EFFLUENT,
B. C. Research Ltd., Vancouver.
K. S. Ng, J. C. Mueller, and C. C. Walden.
Paper Trade Journal, Vol. 157, No. 41, p 45, October 8, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Foam separation, *Pulp wastes, Toxicity, Suspended solids, Fish.
Identifiers: Detoxification, Bleached kraft mill wastes.

Batch and continuous systems have been used to study the technical feasibility of detoxifying bleached kraft whole mill effluent by foam separation. Process variables such as gas/liquid ratio, pH, temperature, column height, and mode of operation were investigated. Bleached kraft whole mill effluents with initial Median Survival Time (MST) values for fish of 6 to 12 hours can be detoxified at pH greater than 7, temperature above 20 C, gas/liquid ratios of less than two, and retention times of about 15 minutes. Effluents with MST values ranging from 3 to 6 hrs require 30 minutes for detoxification under similar conditions. Bubble size, pH, and gas/liquid ratio determine the process efficiency; temperature and column height have little effect. Foam separation also reduces foaming tendency and removes fibrous suspended solids. (Sandoski-FIRL)
W76-08460

DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
J. C. Mueller, and C. C. Walden.
Paper Trade Journal, Vol. 157, No. 41, p 46, October 8, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Biochemical oxygen demand, Toxicity, Pilot plants, Aerated lagoons, Activated sludge, *Pulp wastes.
Identifiers: *Detoxification, Bleached kraft mill wastes.

Four BOD reduction systems, 5-day and 3-day retention aerated lagoons and 8-hr and 24-hr retention activated sludge units, were compared for BOD5 and toxicity removal efficiency on bleached kraft whole mill effluent. The systems were operated with and without surge equalization at various temperatures. During operation with surge equalization, the five-day lagoon achieved the highest BOD5 removal and the most consistent detoxification. The 3-day lagoon and the 24-hr and 8-hr activated sludge systems were slightly less effective. During operation without surge equalization, BOD5 removal by the four systems remained essentially the same, but detoxification efficiency was reduced by 15-30%. Temperature variations between 60 and 90 F had no significant effect on the performance of the systems. Operation of the activated sludge systems at sludge loadings of less than 0.3 mg BOD5/day/mg MLVSS produced detoxified effluent with a 96% sucess rate; operation at higher sludge loadings reduced the detoxification success rate to about 70%. (Sandoski-FIRL)
W76-08461

PAPER PULP EFFLUENT PURIFICATION.
French Patent FR 2159560. Issued June 22, 1973.
Derwent French Patents Report, Vol. U, No. 35, p D4-D5, June, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Patents, Chemical precipitation, Flocculation, Lignins, *Pulp wastes.
Identifiers: Chemical pulp, Semi-chemical pulp, Aluminum sulfate.

A method for treating pulp wastes has been patented. Effluent from the manufacture of chemical and semi-chemical paper pulp is purified by precipitating nonbiodegradable materials in Stage One by the addition of excess aluminum sulfate to a pH 3.8. The clarification solution is then fed to Stage Two for flocculation with the excess dissolved aluminum sulfate at pH 5.4. The precipitate from Stage One and floc from Stage Two are treated to recover aluminum sulfate. The process effectively removes nonbiodegradable salts. (Sandoski-FIRL)
W76-08462

KRAFT EFFLUENT TREATMENT BY FLOTATION,
Saint Mary's Univ., Halifax (Nova Scotia).
E. R. Hayes, and V. G. Munroe.
Paper Trade Journal, Vol. 157, No. 41, p 42, October 8, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Waste water disposal, *Froth flotation, Coagulation, Flocculation, Color, Biochemical oxygen demand, Chemical oxygen demand, Odor, Polyelectrolytes, Flotation.
Identifiers: Kraft mill wastes, Dispersed air flotation, Alum.

Recent efforts had been expended on the development of efficient processes for the treatment or disposal of kraft mill effluents. The system selected for study was that of froth flotation with dispersed air as the transport medium. The relationship between dosage of coagulant and flocculant aid, pH, agitation with respect to float formation, color removal, decrease in biological oxygen demand and chemical oxygen demand, and odor removal were investigated. Several inorganic coagulants and synthetic organic flocculant aids alone and in combination were tested. Alum and selected cationic, synthetic, high molecular weight polyelectrolytes were most effective. Dispersed air flotation of total effluent with alum-cationic polyelectrolyte removed 90% of the color. The BOD and COD were reduced by 50 and 66%, respectively. (Sandoski-FIRL)
W76-08463

THE EFFECTS OF HIGH SODIUM CHLORIDE CONCENTRATIONS AND HIGH POLLUTANT LOADS ON THE COMPOSITION OF THE ACTIVATED SLUDGE MICROFLORA IN THE TREATMENT OF PETROLEUM REFINERY-GENERATED EFFLUENTS (WPLYW WYSOKIEGO STEZENIA CHLORKU SODOWEGO I DUZEGO LADUNKU ZANIECZYSZCZEN NA SKLAD MILROFLORY OSADU CZYNNEGO PRZY OCZYSZCZANIU SCIEKOW RAFINERYJNO-PETROCHEMICZNYCH).
H. Boszczyk, and E. Cebula.
Gaz, Woda i Technika Sanitarna, Vol. 47, No. 6, p 192-194, 1973. 3 fig, 2 tab, 9 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, Activated sludge, Microorganisms, Sodium chloride, Oil wastes, Organic compounds.
Identifiers: Refinery wastes.

Studies were performed to determine the effects of high sodium chloride and pollutant loads on the species composition of activated sludge in the treatment of petroleum-refinery generated effluents. The equipment used for sludge purification on a bench scale included a container of raw sewage, a column for cultivating activated sludge, and a container for purified sludge. Analyses of BTU, oxygenation, phenol concentration, by-volume coefficient of active sludge, and macro- and microscopic observation of the activated sludge indicated that the number of microflora decreased significantly during testing days 2 to 16 and increased during the third stage (days 17 to 22). High sodium chloride concentrations lead to changes in flake structure, decrease in flake size, flake performance, liberation of bacteria from flakes, absence of protozoa, decrease of purification process productivity, and a decrease of sludge volume coefficient. (Urbanski-FIRL)
W76-08464

EFFLUENT TREATMENT IN SELECTED ORGANIC CHEMICAL FACTORIES,
Central Public Health Engineering Research Inst., Nagpur (India).
G. J. Mohanrao, P. V. R. Subrahmanyam, S. S. Mudri, and S. B. Deshmukh.
Indian Chemical Journal, Annual Tissue, p 198-206, 1972. 4 fig, 8 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Organic wastes, Chemical industry, Dyes, Neutralization, Biological treatment, Aerated lagoons, Chemical precipitation, Chlorination, Toxicity, Color.
Identifiers: Synthetic drugs, Petrochemical wastes.

Work performed at the Central Public Health Engineering Research Institute in Nagpur, India, on the treatment of three plants producing organic chemicals, petrochemicals (DMT and xylenes), synthetic drugs, and textile dyes was the basis for the development of flow sheets for waste treatment. Treatment of the wastes from the DMT and xylene plants consisted of lime neutralization followed by biological treatment using a combination of aerated lagoon and oxidation ditch extended aeration plant. Effluent from the plants meets standards for industrial effluents discharged to inland surface waters. The synthetic drugs effluent treatment consisted of neutralization of the acidic waste with lime and sludge separation and drying on sand beds, and dilution of the alkaline wastes with sewage and floor washes followed by biological treatment. Combined effluent discharge to sewers conformed to standards. Treatment of the wastes from the manufacture of textile dyes comprised precipitation of zinc at a pH of 9.2 with lime, sedimentation, biological treatment, and chlorination of the supernatant. The treated waste was non-toxic to aquatic life and essentially colorless. (Sandoski-FIRL)
W76-08465

STAFFLINERS PREVENT CONTAMINANTS FROM POLLUTING GROUND WATER AT INDUSTRIAL WASTE TREATMENT CENTER.
Pollution Engineering, Vol. 5, No. 9, p 8, September, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Groundwater, Water pollution control, Storage, Capital costs, *Linings.
Identifiers: Hypalon linings, Groundwater pollution prevention.

Ultra-wide, impermeable linings have been installed to prevent groundwater contamination by waste chemicals stored in a series of open basins at regional treatment and disposal facilities. Rollins Environmental Services (RES) which operates a network of treatment centers for industrial wastes and chemicals, stores the environmentally hazardous wastes in concrete basins protected with Hypalon linings. Open storage basins entail the least capital cost on a per gallon basis. The protection provided by liners makes this type of storage environmentally acceptable. (Sandoski-FIRL)
W76-08466

RECOVERY AND SEPARATION OF CHEMICALS PRODUCED DURING KRAFT PULPING OPERATIONS,
Scott Paper Co., Philadelphia, Pa. (Assignee).
K. W. Baierl.
United States Patent 3,764,461. Issued October 9, 1973. Official Gazette of the United States Patent Office, Vol. 915, No. 2, p 624, October, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Chemical wastes, *Separation techniques, Distillation, *Patents, *Pulp wastes.
Identifiers: Steam fractionation.

Chemicals produced during kraft pulping operations can be recovered by steam fractionation. The chemicals are further separated by refluxing the more volatile chemicals in the fractionating column to isolate a volatile chemical fraction and a crude turpentine fraction comprising primarily alpha-terpineol. The chemicals present in the volatile fraction can then be separated by four-step process. The volatile chemical fraction is treated with a hot caustic solution to remove a sulfur-containing-chemicals fraction from the volatile chemical fraction. The volatile chemical fraction is treated with steam in a second fractionating column to produce a mixture of chemicals. The more volatile chemicals present in the mixture are refluxed to separate a second volatile chemical fraction and a second crude turpentine fraction comprising primarily alphapinene. The chemicals in the second volatile chemical fraction are finally separated by distillation. (Sandoski-FIRL)
W76-08467

LAND TREATMENT OF FOOD PROCESSING WASTEWATERS,
Campbell Soup Co., Camden, N. J. Environmental Engineering Dept.
For primary bibliographic entry see Field 5E.
W76-08468

RUM DISTILLERY WASTES: LABORATORY STUDIES ON AEROBIC TREATMENT,
Virgin Islands Dept. of Public Works.
W. E. Burnett.
Water and Sewage Works. Vol. 120, No. 9, p 107-111, September, 1973. 1 fig, 3 tab, 13 ref.

Descriptors: *Aerobic treatment, *Waste water treatment, *Industrial wastes, *Food processing industry, Activated sludge, Trickling filters, Laboratory tests, Neutralization, Biochemical oxygen demand, Aerobic conditions.
Identifiers: *Rum distillery wastes.

A laboratory scale study of the treatment of rum distillery wastes by the activated sludge and trickling filter processes is discussed. Benchscale treatment plants were used to determine trends, problems, and possible solutions likely to be important in the operation of full scale waste treatment plants. Both activated sludge and trickling filter could be effective if the waste was neutralized prior to treatment and nutrients were added when needed. Either process or combination of both processes might be used as a roughing process to reduce the BOD5 loading on a municipal treatment plant receiving rum wastes. (Sandoski-FIRL)
W76-08469

A PEROXYGEN SYSTEM FOR DESTROYING CYANIDE IN ZINC AND CADMIUM ELECTROPLATING RINSE WATERS,
E. I. DuPont de Nemours and Co., Wilmington, Del. Industrial Chemicals Dept.
B. C. Lawes, L. B. Fournier, and O. B. Mathre.
Plating, Vol. 60, No. 9, p 902-909, September, 1973. 11 fig, 3 tab, 13 ref, 1 append.

Descriptors: *Waste water treatment, *Industrial wastes, Chemical precipitation, Heavy metals, *Zinc, *Cadmium, Filtration.
Identifiers: *Electroplating wastes, *Cyanide, *Peroxygen.

A one-stage patented process which uses a peroxygen compound system to destroy free cyanide and precipitate zinc and cadmium metals in electroplating rinse waters is described. A proprietary peroxygen compound and formalin are added in controlled amounts to rinse water in a holding tank. The reaction is fast and control is simple. In one hour or less, the treated rinse can be discharged directly to the sewer through a filter which collects the zinc and cadmium precipitates. The process can also be used to treat other cyanide-containing waste waters. (Sandoski-FIRL)
W76-08470

PROCESS FOR THE ELECTROLYTIC RECLAMATION OF SPENT ETCHING FLUIDS,
Electrodics, Inc., Philadelphia, Pa. (Assignee).
C. E. Tirrell.
United States Patent 3,761,369. Issued September 25, 1973. Official Gazette of the United States Patent Office, Vol. 94, No. 4, p 1394, September, 1973. 1 fig.

Descriptors: *Waste water treatment, *Electrolysis, Industrial wastes, Metals, Cathodes, Anodes, Ion exchange, Copper, Oxidation, *Patents.
Identifiers: *Copper etching wastes, *Electrolytic reclamation.

A patent has been issued for a method and apparatus for the electrolytic reclamation of spent copper etching fluids. The problem of waste discharge stream pollution by aqueous solutions of iron and chromium metal is corrected by passing the spent etchant, as the catholyte, into the cathode chamber of a two chamber elecrrolytic cell having an anion permselective ion exchange membrane separating the cathode chamber from the anode chamber. The anolyte is the chemically reduced spent etchant of a previous batch. When a direct current is passed through the cell, copper is reduced and deposited on the cathode, and the chemically reduced spent etching fluid is oxidized in the anode chamber. The oxidized etching fluid is thereby reclaimed for further use. (Sandoski-FIRL)
W76-08471

TREATMENT OF PHOTOGRAPHIC FERROCYANIDE-TYPE BLEACH SOLUTIONS FOR REUSE AND DISPOSAL,
Computerized Pollution Abatement Corp., Leicester, N. Y.
T. N. Hendrickson, and L. G. Daignault.
Journal of the Society of Motion Picture Television Engineers, Vol. 82, No. 9, p 727-732, September, 1973. 15 fig, 7 tab, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Electrolysis, Ozone, Chlorination, Heavy metals, Chemical precipitation, Recycling, *Water reuse, Waste water disposal.
Identifiers: *Photographic processing wastes, Ferricyanide, Ferrocyanide.

Methods to recover or destroy complex cyanides (ferrocyanide and ferricyanide) have been evaluated in laboratory studies. The processes examined included electrolysis, ozonation, chlorination, and heavy metal ion precipitation. The goal of the investigation was to determine the feasibility of using one or more of these methods to reduce the concentration of ferricyanide in both concentrated (10,000 to 100,000 mg/liter) and dilute (10 to 100 mg/liter) waste effluents. Ferrocyanide can be oxidized to ferricyanide in overflow photographic color process bleaches by electrolysis or ozone. The regenerated waste bleach can be recirculated for reuse in the process. Dilute concentrations of ferricyanide can be destroyed using ozone or chlorine under the proper conditions of temperature, pH, and catalayst addition. (Sandoski-FIRL)
W76-08472

INDUSTRIAL EFFLUENT TREATMENT,
Belgian Patent BE 794932. Issued May 29, 1973. Derwent Belgian Patents Report, Vol. U, No. 33, p D5, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Heavy metals, Oxidation, Flocculation, Coagulation, Sedimentation, Treatment facilities, *Patents.

A treatment method for industrial effluents from metallurgical furnaces has been patented. These wastes are treated in a compound vessel which simultaneously effects the previously isolated stages of oxidation to decompose the cyanides, and which effects mechanical flocculation to coagulate the pollution residues, ready for sedimentation. The vessel reduces the size, weight, and cost of this effluent treatment plant. (Sandoski-FIRL)
W76-08473

CRUDE SOAP RECOVERS MERCURY FROM WATER,
Agricultural Research, Vol. 22, No. 3, p 11, September, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Mercury, Potable water, *Soaps, Emulsions, Florida.
Identifiers: Crude black liquor soap.

The ARS Naval Stores Laboratory in Olustee, Florida has found products effective in reducing the mercury content of water to well below the 5 ppb now permitted in drinking water. The most effective product is crude black liquor soap, a 3-cent-per-pound byproduct of the kraft pulp process. The soap is derived from the kraft process where wood chips are cooked to release the cellulose fibers for use in paper making. In treating mercury-laden water, very small amounts of the black liquor soap are added to the water and mixed well. An emulsion forms and water insoluble mercury salts of the soap result. The emulsion is then broken by acidifying the solution and the solids containing the mercury are filtered. The recovered sludge can be buried, or the mercury recovered by treatment with acid, or the mercury containing products can be added to copper tallates or resinates. (Sandoski-FIRL)
W76-08474

TREATMENT METHOD FOR OIL-CONTAINING LIQUID WASTE (GANYU HAISUI SHORIHO),
R. Fukumori.
(Asada Chemical Industries), Japanese Patent 48-18069. Issued June 2, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil wastes, Oily water, Absorption, Polymers, Flocculation, Suspended solids, *Patents, Separation techniques.
Identifiers: Absorbent polymer foam powder.

Waste liquids from industrial sources can be treated effectively with most suspended solids being eliminated. However, oil diffused on the surface of such wastes is extremely difficult to arrest and the water after treatment will contain some residue oil. A method has been patented which eliminates oil residue by adding absorbent polymer foam powder prior to stirring the waste liquid with the chemical treating agent. Foam powder from an olefin group polymer or styrene group polymer absorbs oil while the suspension is coalesced by the chemical agent; the liquid is then filtered. The presence of foam powder enhances flocculation. The raw waste liquid with a turbidity of 420, pH of 5.99, 216.9 ppm n-hexane oil and 178 ppm COD, was heated from 80 to 100 C; 600 ppm polychloride aluminum was added followed by the addition of 0.5 grams of foam polyethylene micropowder. The mixture was rotated and mixed at 120 rpm's for five minutes. Caustic soda (10 ppm) was added,

pH was adjusted to 7, and the liquid was filtered. The treated liquid had a turbidity of 15, pH of 6.20 and contained 2.7 ppm n-hexane oil, and 38 ppm COD. (Seigle-FIRL)
W76-08475

ELIMINATION METHOD FOR MERCURY RESIDUE IN WATER (SUICHU YOZON SUIGIN NO JOKYOHO),
R. Kubo, M. Mizufune, and T. Ito.
(Takeda Pharmaceutical Company), Japanese Patent 48-13676. Issued April 28, 1973. 3 p, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Adsorption, *Mercury, *Activated carbon, *Patents.

A high performance adsorbent for high or low concentrations of mercury residues in waste liquid has been invented. The method of preparation of the adsorbent is simple; it is desirable for the mercury content in waste liquid to be low, but the method is applicable provided the concentration is below 30 ppm. The amount of adsorbent should be approximately 0.5 to 20 weight percent of activated carbon. This metallic salt can be a mixture of more than two kinds of elements, or a small amount of sodium carbonate or potassium carbonate can be added to the metal as a supplement. (Seigle-FIRL)
W76-08476

UPDATING AN EXISTING POLLUTION CONTROL FACILITY AT WESTERN ELECTRIC,
Western Electric Co., Inc., Allentown, Pa. Plant Engineering Dept.
W. B. Yorgey.
Industrial Wastes, Vol. 19, No. 4, p 16-18, 30-31, July/August, 1973. 9 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Treatment facilities, Neutralization, Suspended solids, Costs, Chromium.
Identifiers: *Cyanide wastes.

Western Electric's Allentown Works (Allentown, Pennsylvania) treats acid-alkaline, chrome, cyanide, and suspended solids wastes. Neutralization facilities were added to the existing acid-alkali treatment facilities, and tanks were added which convert cyanide wastes to carbon dioxide and water. New facilities for reducing chrome wastes and removing suspended solids were installed as well as an integrated system of monitoring and control instrumentation. Increases in production and more stringent effluent requirements have resulted in a present discharge of about 800,000 gpd of treated waste water. About one million dollars worth of treatment facilities have been added to the original waste water plant. (Sandoski-FIRL)
W76-08477

PLATING WASTE RECOVERY UNIT,
A. Yagishita.
United States Patent 3,761,381. Issued September 25, 1973. Official Gazette of the United States Patent Office, Vol. 914, No. 4, p 1397, September, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Ion exchange, Resins, Chromium, Metals, Filtration, *Patents.
Identifiers: Plating wastes, Chromic acid, Regeneration, Sodium chromate, Barium chromate.

A unit for reclaiming plating wastes containing chromic acid has been patented. The rinse liquid, from one of many wash tubs into which plated articles are dipped successively to rinse off the plating solution, is circulated through an ion exchange column, where it passes through a resin layer that removes chromic acid and other impurities before the liquid is returned to the wash tube. Periodically, or when saturated with chromic acid, the resin is regenerated by pumping a solution of caustic soda through the exchange column. This produces a sodium chromate solution to which barium hydroxide is added to produce barium chromate, which is filtered out of the caustic soda solution before the latter is again used for regeneration. (Sandoski-FIRL)
W76-08478

PICKLING WITH HYDROGEN PEROXIDE SOLUTIONS,
P. Fintschenko.
Product Finishing, Vol. 26, No. 9, p 30-33, September, 1973. 4 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Recycling, Water pollution control, Water reuse.
Identifiers: *Hydrogen peroxide pickling, Metal finishing, Zero discharge.

Fabrico Manufacturing Corporation, a major manufacturer of hydrogen peroxide, has investigated the problem of stabilizing peroxide for use in copper pickling. They have developed a hydrogen peroxide product which provides superior stability for pickling applications. Hy-Brite allows most pickling operations to use a hydrogen peroxide pickling process economically. The end products of pickling with hydrogen peroxide are the same as the end products of ordinary acid pickling. However, a peroxide pickle is indefinitely regenerable when used in conjunction with a recovery process. Hydrogen peroxide should only be used in sulfuric acid solutions. The use of peroxide in sulfuric acid for concurrent black and red oxide removal is not recommended unless long pickle times and very low peroxide levels are used. (Sandoski-FIRL)
W76-08479

WATER TREATMENT SYSTEM SAVES 45,000 GALS DAILY.
Plant Operation Management, Vol. 93, No. 4, p 43, October, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Heavy metals, *Ion exchange, Treatment facilities, Resins, Separation techniques, Ion transport, Chromium, Anion exchange, Cation exchange, *Water reuse, Recycling, Illinois, Costs.
Identifiers: Regeneration, Chromium plating wastes.

More stringent effluent restrictions forced the waste effluent treatment facilities for General Electric's chrome plating line at its range products plant in Cicero, Illinois, to develop an effective economical method of treating 45,000 gal of waste water produced daily. The system selected was a two-bed system by Hytek International. Waste water first passes to a column that contains a 35 cu ft bed of Amberlite IR-120 exchange resin. This removes iron, nickel, trivalent chrome, and other cations. The second unit, containing Amberlite IRA-402 exchange resin removes the hexavalent chrome, fluorides, sulfates, chlorides, and miscellaneous anions. The ion exchange resins are automatically regenerated. During regeneration, the unwanted chromate and other ions adsorbed by the resins are removed by a solution of sodium hydroxide. (Sandoski-FIRL)
W76-08480

COOPERATION HELPS ERIE,
Erie City Public Works, Pa.
R. J. Waytenick, Crankshaw, and G.I. Brask.
Water and Wastes Engineering, Vol. 10, No. 9, p 76-77, September, 1973. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, Water pollution control, Treatment facilities, Screens, Pulp and paper industry, Phosphorus, Activated sludge, Sludge treatment, Dewatering, Incineration, Pennsylvania.
Identifiers: Vacuum filters, Step aeration, Joint treatment.

A joint treatment agreement between Erie, Pennsylvania, and the Hammermill Paper Company is part of the city's expansion program for its water pollution control facility. The plan calls for separate screening and grit removals for the municipal flow and separate primary treatment for the municipal and Hammermill flows. Controlled phosphorus removal at substantial savings is achieved because of the phosphorus demand of the Hammermill waste. The secondary treatment units will be based on the use of the step aeration process. Piping and channel arrangements will also permit the use of contact stabilization and conventional treatment processes. The primary settled sludges and the thickened waste activated sludge will be combined and pumped to vacuum filters for dewatering. The filter cake will be incinerated. (Sandoski-FIRL)
W76-08481

PROCESS FOR TREATING WATER-SOLUBLE ORGANIC WASTES,
Texaco, Inc., New York. (Assignee).
E. L. Cole, and H. V. Hess.
United States Patent 3,772,181. Issued November 13, 1973. Official Gazette of the United States Patent Office, Vol. 916, No. 2, p 661, November, 1973. 1 fig.

Descriptors: *Patents, *Organic wastes, *Waste water treatment, *Oxygen, Effluents, Oil wastes, Chemical oxygen demand.

A process has been patented for treating a waste feed stream containing water-soluble organic wastes. These include waste originating in refinery reservoirs, refinery waste streams, refinery pits, and lube oil additive plants. The method involves heating the stream under turbulent flow conditions to temperatures of 400 to 700 F and pressures of 300 to 3100 psi in the presence of air or oxygen, thereby splitting off carbon dioxide. The oxidized waste stream has a considerably reduced chemical oxygen demand and is continuously fed to a hot contacting zone. The waste stream thus is in a heat-exchange relationship with an incoming effluent stream. (Sandoski-FIRL)
W76-08482

POLLUTION PROBLEM SOLVER,
Chrysler Corp. Syracuse, N. Y. New Process Gear Div.
R. M. Bertrand.
Instrumentation, Vol. 25, No. 2, p 3-6, 1973.

Descriptors: *Waste water treatment, *Oil wastes, *Industrial wastes, Waste discharge, *Recycling, Separation techniques, Monitoring, *Water reuse, New York.
Identifiers: Waste reuse.

The Chrysler Corporation's Syracuse, New York, plant has implemented a treatment method in which one operator, working on a single shift, can process 250,000 gallons of waste water. An intricate Honeywell-supplied automation system is utilized whereby the operator can handle treatment sequence that removes free oil for processing and reuse, and reduces the remaining emulsified oils to suspended solids that are acceptable to the local municipal primary sewage treatment plant. The treatment facility is a four-story building surrounded by three 250,000-gallon batch processing tanks. A sewer system receives all waste oils, soluble oil coolants, discharge from floor scrubbers, and drainage from oil storage pads and chip hoppers. The system terminates in two receiving pits and pumping stations. The waste water, after passing through grit separator to remove solids, is pumped into one of the tanks in the treatment facility. Wastes are treated when the level in a batch tank reaches a predetermined height below an overflow weir near top of the

tank. The operator checks a sample of the processed waste water, and if it complies with set limits, the batch tank is drained to a sanitary sewer. Oil accumulating in the water-oil tank is further processed so that it is dewatered and concentrated to a grade economically feasible for disposal to a commercial rerefiner. (Sandoski-FIRL)
W76-08483

REMOVAL OF OIL POLLUTION.
French Patent FR 216289. Issued July 20, 1973. Derwent French Patents Abstracts, Vol. U, No. 40, p D4, July, 1973.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Water pollution control, *Oil wastes, Cellulose, Fibers(Plant).

A treatment method for oil pollution and the removal of suspended materials from water using hydrophobic cellulose fibers has been patented. Polluted water is contacted with a hydrophobic cellulose fiber material which shows an affinity for the suspended matter. The cellulose material is a wood fiber with individual fibers completely coated with a hydrophobic material, such as wax, bitumin, resin, elastomer, or thermoplastic resin, and is molded into a suitable shape before use. The materials may be used to absorb oil, suspensions, slimes, and gels from water up to their volume capacity without sinking. (Sandoski-FIRL)
W76-08484

NEW INCINERATION METHOD SOLVES GREASE PROBLEM IN RICHMOND, PA.,
Philadelphia Water Dept., Pa. Northeast Water Pollution Control Plant.
For primary bibliographic entry see Field 5E.
W76-08485

REVERSE OSMOSIS SYSTEM CORRECTS HIGH BOD WASTES: YIELDS NET OPERATING SAVINGS,
Osmonics, Inc., Hopkins, Minn.
D. D. Spatz.
Filtration Engineering, Vol. 4, No. 4, p 13-15, July/August, 1973. 1 fig, 1 tab.

Descriptors: *Biochemical oxygen demand, *Reverse osmosis, Food processing industry, Costs, *Industrial wastes, *Waste water treatment, Cleaning.
Identifiers: Candy manufacturing industry.

Water, used to lubricate the cutters of a large candy manufacturer was previously discharged after lubricating the cutters. This water solution represented 10,000 gal per 20-hour day of 2-3% sucrose solution, and contained a high BOD waste stream. An evaluation showed that a reverse osmosis system would remove over 99% of the BOD, sucrose, glucose, coconut fines, and coconut oil from the solution. It was established that 25% total solids could be obtained on a continuous basis, and that excellent candy could be made from the concentrate of the reverse osmosis machine. The machine is cleaned daily with a clean-in-place flush of C-S detergent, which is allowed to stand in the machine for one to two hours. When the machine is started up, the C-S solution is flushed out with water and the machine is switched to the sugar solution. Considering only the sugar savings (although the water savings would approach $100 per month) there is a net operating savings of $4025 per month with the reverse osmosis system. (Sandoski-FIRL)
W76-08486

TREATMENT OF EFFLUENT.
South African Patent ZA 7208108. Issued June 22, 1973. Derwent French Patents Abstracts, Vol. U, No. 38, p F1, August, 1973.

Descriptors: *Patents, *Waste water treatment, *Cellulose, Pulp and paper industry, Organic matter, Oxidation, Bleaching wastes, *Pulp wastes, Effluents.
Identifiers: Waste reuse.

A method of treating effluent from a cellulosic pulp bleaching process was patented. An oxygen containing gas is used to treat the effluent in a reactor at 200-375 C and a total pressure sufficient to maintain most of the water in the liquid phase. Organic material is oxidized completely and an alkaline inorganic solution is regenerated, which is suitable for reuse in the bleaching process. (Sandoski-FIRL)
W76-08488

FIBER RECOVERY INCREASES WATER REUSE, REDUCES TREATMENT COST,
Dorr-Oliver, Inc., Stamford, Conn.
R. J. Mattison, and F. J. Brandon.
Paper Trade Journal, Vol. 157, No. 43, p 20-21, October 29, 1973.

Descriptors: Pulp and paper industry, *Water reuse, *Recycling, Centrifugation, *Waste water treatment, *Industrial wastes, Clarification, Waste disposal, *Pulp wastes, Costs, Fibers(Plant).
Identifiers: Fiber wastes rescovery.

Selected, long clean saleable fiber may be recovered by the action of a DSM System for paper mills. The operating device is a screen comprising a series of bars with a wedge-shaped cross-section. The bars are mounted so that the slurry tends to react in a centrifugal fashion. Each bar slices off a predictable layer of slurry, passing only those particles smaller and those fibers shorter than the slot width. Thus the DSM System can separate useful fiber from fines, fillers, and small dirt. A highly detailed study was made at a large tissue mill in Pennsylvania and showed that previously, three flotation clarifiers provided final treatment to 8 to 9 mgd of waste water from 11 paper machines and associated equipment. While these flotation units generally operated efficiently, they often overflowed when slugs of water with as much as 2400 ppm entered the system. Now, the full flow of the mill sewer is run through DSM units to thicken the recovered stock after cyclone cleaning. This stock is returned to the bleach system. Cleaner rejects are added to the clarifier sludge for centrifugal dewatering and disposal. The DSM System recovers 39% of the sewered fiber at 5% consistency. Additional savings result from reuse of some of the sewered water and from reduced maintenance requirements at the flotation clarifiers. (Sandoski-FIRL)
W76-08489

HEAVY METAL SALTS RECOVERY.
West German Patent DT 2230243. Issued October 4, 1973. Derwent German Patents Abstracts, Vol. U, No. 41, p M3, October, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, Reverse osmosis, *Patents, Salts.
Identifiers: *Metal finishing wastes, Metallic salts.

A method for the recovery of heavy metal salts from industrial effluents based on either inorganic or organic solvents has been patented. In this process, effluent is first concentrated and then subjected to reverse osmosis. The method can be used for the recovery of the following metal salts from plating or anodizing bath effluents as well as from dye vat rinses: Pt, Pd, Rh, Au, Ag, Ni, Cu, Zn, Cr, Cd, Fe, and Al. (Sandoski-FIRL)
W76-08490

IMS-GRANGCOLD PELLETIZING SYSTEM FOR STEEL MILL WASTES MATERIAL,
International Mill Service, Philadelphia, Pennsylvania.
H. D. George, and E. B. Boardman.
Iron and Steel Engineer, Vol. 50, No. 11, p 60-64, November, 1973. 7 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Steel, Portland cements, *Byproducts, Recycling.
Identifiers: *Steel making processes, Cold bonded pellets, *Grangcold pelletizing process.

The Swedish Grangcold pelletizing process has been adapted to utilize byproducts of the steel making process such as blast furnace dust and sludge, fine mill scale, fired pellet screenings, coke breeze, and iron fines. The pellet process uses a hydraulic adhesive, portland cement, for the production of cold bonded pellets which are mixed in a suitable amount of the balling concentrate, minus the cement, before storage. The pellets are embedded in the concentrate during initial storage so as to be isolated from each other. The embedding concentrate subjects the pellets to a uniform pressure on all sides which eliminates deformation of the pellet. The mixture can be stored in a stockpile or in a bin until sufficient hardening is obtained. The concentrate is then separated from the pellets by screening and the concentrate recycled to the balling operation. The pellets are shipped either to a blast furnace or stored for final hardening. A 1.5 million tons per year production plant has been operating in Grangesberg, Sweden, for three years. The operation and economics of this plant are detailed. (Sandoski-FIRL)
W76-08491

TREATING WASTE LIQUORS CONTAINING METAL-WORKING OIL EMULSIONS.
West German Patent DT 1594406. Issued September 27, 1973. Derwent German Patents Abstracts, Vol. U, No. 40, p M2, September, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Emulsions, *Patents, Oily water, Adsorption, *Oil wastes, Separation techniques.
Identifiers: Metal working oils, Cutting oils.

A patent for a method of treating waste liquors containing metal-working oil emulsions has been assigned. The wastes are separated into a pure aqueous phase and an oil phase containing the impurities by treating the effluent at its boiling point with a mixture of a cleaving agent and an adsorbent, a hydrophobic silicic acid, for the oil phase. The cleaving agent is either an akaline earth formate or a metal halide, which hydrolizes at the process temperature. Preferably 10 to 50 parts of mixture of silicic acid and alkaline earth formate or Al halide is used on 100 parts of cutting oil concentrate. (Sandoski-FIRL)
W76-08492

METALLIC RECOVERY SYSTEM,
Air Preheater Co., Inc., Wellsville, N. Y. (Assignee).
N. D. Hazzard, and W. M. Anderson.
United States Patent 3,780,676. Issued December 25, 1973. Official Gazette of the United States Patent Office, Vol. 917, No. 4, p 1279-1280, December, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Organic compounds, Inorganic compounds, Oxidation, Heat treatment, Equipment, *Recycling, Water reuse.
Identifiers: *Pyrolysis, Matallic recovery system.

A conversion system for waste containing organic and inorganic components in which the organic components are pyrolyzed in an essentially oxygen-free atmosphere so as to prevent the oxidation of the inorganic constituents has been patented. An afterburner provides the necessary heat for burning pyrolyzed gases and the carbonaceous particulate matter formed in the pyrolyzing chamber. The pyrolyzing chamber is maintained at a suitable temperature for properly

pyrolyzing waste material by cooling the hot gases from the afterburner with cool ambient air and then directing the mixed gases over the pyrolyzing chamber. (Sandoski-FIRL)
W76-08493

EFFLUENT WATER TREATMENT.
Netherlands Patent NL 7304233. Issued October 2, 1973. Derwent Netherlands Patents Abstracts, Vol. U, No. 42, p D2, October, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Heavy metals, *Ions, Salts, Effluents, Filtration, Drying, Chemical precipitation.
Identifiers: *Metallic salts.

The patented process described involves treating waste water to remove small quantities of heavy metal ions by mixing the water with a mixed salt containing FeS and BaS04 with an excess of sulfide ions. The salts can be formed by mixing BaC12, Na2S, FeS04, and CaC12 in aqueous medium and filtering and drying the precipitate; a molecular ratio for Fe/Ba of 1/1-3/1 and for Fe/Ca of 2/1-1/2 is preferred. Beds of the mixed salt provide for good removal of heavy metal ions from industrial waste water before discharge to rivers or other water bodies. (Sandoski-FIRL)
W76-08494

SETTLING TANK,
I. F. Tikhonov, and G. D. Isaev.
Soviet Patent SU 367874. Issued April 13, 1973. Soviet Inventions Illustrated, Vol. U, No. 41, p J1, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, *Patents, Chemical wastes, *Settling basins, Equipment, Suspended solids, Sedimentation, Separation techniques.
Identifiers: Sloped plates.

A patent has been issued for the removal of suspended solids from industrial effluents. Suspended particles are removed from liquids in the chemical and metallurgical industries by passage through a settling tank in the form of a vertical cylinder with inlet and outlet pipes, a mud-separating pipe, an axial body, microsettlers formed from sloping plates, and mud-retaining baffles. The operational efficiency is augmented by designing the liquid feed system in the form of radial channels open at the peripheral and upper sections, and formed from vertical plates positioned in pairs on the mud-separating pipe. The suspended particles settle out in the micro-settlers. The resultant mud comes out through the slits and down the mud-separating pipe. The clean water goes out through the top. (Sandoski-FIRL)
W76-08495

SOUR WATER TREATMENT PROCESS.
Process Technology, Vol. 18, No. 11, p 421, November, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Byproducts, *Water reuse, Ammonia, Hydrogen sulfide, *Recycling.
Identifiers: Refinery wastes, Sour water, *Sour water stripper.

The Chevron Waste Water Treatment process treats refinery waste water and converts it into three valuable products: high purity hydrogen sulfide; pure ammonia; and treated water for recycle or discharge. Combined feed water from a degassing unit is pumped through a feed heater into a reboiler stripper column where H2S is stripped overhead and water and ammonia flow downwards and out as column bottoms. The column overhead is high purity H2S which contains negligible ammonia and very little hydro-carbons. Bottoms from the first column are fed directly to a second reboiler stripper column. A clean water, suitable for many in-plant needs, is produced while the ammonia overhead product requires further processing to remove small amounts of H2S and sulfur. The economies of the process are very dependent on the feed concentration; a more concentrated feed requires a less expensive plant. (Sandoski-FIRL)
W76-08496

REMOVING FINE PLASTIC PARTICLES FROM WASTE WATER.
Belgian Patent BE 798884. Issued August 16, 1973. Derwent Belgian Patents Report, Vol. U, No. 41, p D2, August, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, Chemical wastes, *Patents, *Plastics, Surfactants, Foaming.
Identifiers: *Polyvinyl chloride.

A patent for a method of removing fine particles of plastic material, especially polyvinyl chloride, from waste water has been granted. This treatment process includes the following steps: adding a surfactant which produces a foam in the waste water; subjecting the waste water to the action of a stream of gas bubbles; and, removing the foam which has accumulated at the surface of the bath and contains a high concentration of fine plastic particles by raking. Essentially complete removal of the fine plastic particles from the waste water is achieved using a relatively small quantity of surface active agent. (Sandoski-FIRL)
W76-08497

SLURRY-BURNING PROCESS.
Process Technology, Vol. 18, No. 11, p 423, November, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Waste disposal, *Incineration, Operating costs, Capital costs, *Slurries, *Oil wastes, Organic compounds.
Identifiers: Refinery wastes.

A combustion process developed by Wintershall A. G., has simplified the disposal of bulk acid and hydrocarbon refinery wastes. The slurry-burning process, which can be used with any type of furnace, employs a newly designed burner and a single homogenizing pump. A pre-heated mixture of solids and combustible liquids is drawn from a tank by the pump which homogenizes the mixture and pumps the slurry to the burner. The burner is in a casing which supplies secondary air to cool the burner pipe and jet, and to adjust the length and shape of the flame with respect to the conditions in the furnace. Extra air required for complete combustion is drawn through the furnace port at a rate controlled by the combustion process. The process has a 55 percent reduction in operating costs and 50 percent reduction in capital costs compared to conventional processes. (Sandoski-FIRL)
W76-08498

DETERMINATION OF TRACES OF CARBON IN SOLID AND LIQUID WASTES OF CHEMICAL PLANTS BY MEANS OF THERMAL CONDUCTIVITY MEASUREMENTS (BESTIMMUNG VON SPUREN KOHLENSTOFF IN FESTEN UND FLUESSIGEN ABFALLSTOFFEN DER CHEMISCHEN INDUSTRIE MIT HILFE DER WAERMELEITFAEHIGKEITSMESSUNG),
Farbwerke Hoechst, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5A.
W76-08499

RAPSON IDEA SET FOR MILL TRIALS.
Canadian Chemical Processing, Vol. 57, No. 11, p 33-34, November, 1973. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Filtration, Evaporation, Crystallization, Sodium chloride, *Pulp wastes, Utah, Recycling, Water reuse.
Identifiers: *Salt recovery process(Reeve/Rapon), Bleached kraft mill effluents, White liquor.

The Reeve/Rapson Salt Recovery Process (SRP) will soon be tested for use in treating bleached kraft mill effluents. In the SRP system, the precipitate from white liquor is recovered by filtration and then leached with water to redissolve the carbonate. The remaining solid is pure NaCl which can either be sold or used on-site to generate bleaching chemicals such as chlorine dioxide, chlorine, or caustic soda. During pilot studies at Salt Lake City, Utah, the white liquor evaporation system was modified to include two evaporator-crystallizer stages. The liquor from the recausticizing plant is concentrated in the first stage to 26-30 weight percent NaOH plus Na2S at a final liquor temperature between 250 and 260 F. Over 80 percent of the water is evaporated in stage 1; the second stage accounts for slightly less than 20 percent. Stage 2 operates at a lower temperature range, 165-200 F, and produces a white liquor concentration from 36-42 weight percent NaOH + Na2S. The NaCl is crystallized out, as well as anhydrous Na2C03 and additional burkeite salt. The final white liquor concentrate contains small amounts of salt, soda ash, and saltcake; the active alkali content was sufficient for pulping. (Sandoski-FIRL)
W76-08500

DETERMINING OIL CONTENT, IN WATER.
For primary bibliographic entry see Field 5A.
W76-08501

LIBBY, MCNEILL SOLVES AN ODOR PROBLEM,
H. W. Stone, and J. V. Ziemba.
Food Engineering, Vol. 45, No. 12, p 99-100, December, 1973. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, *Odor, Equipment, Water reuse, Biochemical oxygen demand, Wisconsin.
Identifiers: *Beet peeling system.

A new waste-eliminating beet peeling system coupled with controlled chemical treatment installed at the Libby, McNeill and Libby Wisconsin cannery has reduced the BOD from 3500-4000 ppm to 50-75 ppm after lagooning and caused a significant drop in the hydraulic load from 1.25 to 0.60 mgd. Installed to eliminate the odor problem, equipment costs together with an improvement program ran approximately $100,000. Measures are being initiated to minimize production of waste and to conserve water by recycling. Over 99 percent of the solid beet matter is screened from effluent before it leaves the cannery. Two new magnascrubbers, developed by Magnuson Engineering, eliminate peel waste from the regular effluent and the number of 5-hp Dunkley aerators installed in the lagoons has almost doubled, from 24 to 42 in two years. (Sandoski-FIRL)
W76-08502

ANIMAL FOOD.
French Patent FR 2165034. Issued August 3, 1973. Derwent French Patents Abstracts, Vol. U, No. 42, p D5, August, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, *Patents, Yeasts, Foods, Pollution abatement.
Identifiers: Beet pulp, Fermentation wastes.

An industrial pollution abatement measure has been patented. Waste disposal is eliminated by an animal food process which utilizes beet pulp or yeast wastes from alcoholic fermentation. The animal food contains a mixture of dried beet pulp waste containing 20 percent cellulose and 30 percent other glucides on a dry weight basis and more than one yeast from either alcoholic fermentation

or wine distillation which are 40-50 percent protein rich and of high vitamin B content. The food contains 10-16 percent proteins, 3-4 percent fats, and 15-18 percent cellulosics. Other ingredients are wheat and maize. (Sandoski-FIRL)
W76-08503

DRY CAUSTIC PEELING OF BEETS AND CARROTS REDUCES POLLUTION,
New York State Agricultural Experiment Station, Geneva. Dept. of Food Science and Technology.
C. Y. Lee, and D. L. Downing.
Food Technology, Vol. 27, No. 12, p 40-41, 44-45, December, 1973. 7 fig. 2 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Pollution abatement, Water conservation, Water demand, Suspended solids, Chemical oxygen demand, Biochemical oxygen demand.
Identifiers: *Dry caustic peeling.

A preliminary pilot plant experiment conducted in early 1972 on the dry caustic peeling of beets and carrots offered a promising approach to the problems of cannery waste and processing yield. The conditions for continuous commercial-scale operation for the dry caustic peeling of beets were established by conducting pilot-plant and commercial scale tests during the 1972 processing season. A systematic survey of the peeling operation to measure peel loss, water consumption, and other factors pertaining to the measurement of pollutants was conducted on both the conventional lye peeling operation and the dry caustic method. In continuous processing of beets at the rate of 8 ton/hour, peeling loss for conventional peeling was around 30%, while dry caustic peeling showed only a 21% loss. A 75% reduction in water usage and an 85% reduction of total solids waste from the peeling line were effected by the dry caustic peeling method. Suspended solids were reduced from 4.3 lb/ton to 0.5 lb/ton and COD and BOD were reduced more than 90% by the dry caustic procedure. Results from testing for carrot processing showed similar reductions by using the dry caustic peeling method. (Sandoski-FIRL)
W76-08504

PURIFICATION OF WASTE WATER.
West German Patent DT 1658043. Issued October 18, 1975. Derwent German Patent Abstracts, Vol. U, No. 43, p D1, October, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, *Patents, Nitrogen compounds, Fermentation, Biological treatment, Fermentation, Potatoes, Sulfite liquors, Chemical precipitation, Water purification.
Identifiers: Lignin sulfonic acids.

A purification system for waste water from a potato factory has been patented. Under this patent, waste water containing proteins, polypeptides, and other nitrogenous compounds is treated with lignin sulfonic acids or their salts preferably in more than two stages to precipitate the nitrogenous matter. After the precipitated material is filtered, the remaining liquid is subjected to fermentation with a suitable organism and/or to biological purification. The lignin sulfonic acids or salts used may have different molecular weights and may be sulfite waste liquors. (Sandoski-FIRL)
W76-08505

SULPHURIC ACID CONTAINING RINSES, PURIFICATION,
R. K. Alekseeva, A. I. Ivanov, and V. I. Polevshchikov.
Soviet Patent SU 368186. Issued April 9, 1973. Soviet Inventions Illustrated, Vol. U, No. 41, p 2, October, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Ion exchange, Resins, Heavy metals, *Patents, Sodium chloride, Ions.
Identifiers: *Sulfuric acid.

The conventional method for the removal of heavy metals such as lead, zinc, and cadmium from solutions by sorption of the metals as chloride complexes on an anion-exchange resin cannot be used for purification of solutions containing sulfuric acid. However, by this patented process, the drawback is overcome by the preliminary addition of chloride ions, such as, sodium chloride in a concentration less than 50 grams per liter. This permits utilization of waste solutions from the production of sulfuric acid by the contact process in the electrolytic manufacture of nickel. It provides for the preparation of the electrolyte and for maintaining a constant amount of chloride ions in it. (Sandoski-FIRL)
W76-08506

DECONTAMINATION OF WASTEWATERS AT THE STAGE OF POTASSIUM ARABONATE IN THE PRODUCTION OF VITAMIN B2, (IN RUSSIAN),
All-Union Scientific Research Inst. for Vitamins, Moscow (USSR),
E. A. Pan'kov, N. F. Zoteeva, and G. P. Chernysh.
Khim-Farm Zh. 9(2), p 53-54, 1975.

Descriptors: *Waste water treatment, Vitamins, Oxygen, Chemical wastes, *Potassium compounds, *Vitamin B, Fertilizers, Acidic water, Chemical oxygen demand, Biochemical oxygen demand.
Identifiers: *Potassium arabonate.

A method of decontaminating the wastewater of the potassium arabonate stage in vitamin B2 production by using the wastes of mineral acids of other vitamin production reduces the initial absolute value of the chemical O2 demand of the wastewater discharge by 2.5-3 times, reduces the quantity of acidic wastewater entering the neutralization station and permits extraction of the mineral part of the effluent as K salts suitable as fertilizers. The wastewater before contamination is toxic to or lowers the chemical and biochemical O2 demand of microorganisms in biological purification systems.--Copyright 1976, Biological Abstracts, Inc.
W76-08578

STUDY OF THE EFFECTIVENESS OF REMOVING HEAVY METALS IN BIOLOGICAL PURIFICATION OF MUNICIPAL SEWAGE, (IN RUSSIAN),
T. M. Savranskaya.
Gig Sanit. 3, p 120-122, 1975.

Descriptors: Sewage, *Municipal wastes, *Activated sludge, Sludge, Mathematical studies, *Equations, Aeration, *Heavy metals, Water pollution sources, *Waste water treatment.
Identifiers: Michaelis-Menten equations.

The process of heavy metal removal by activated sludge is described by a modified Michaelis-Menten equation. The effectiveness of heavy metal removal in biological municipal sewage treatment depends mainly on the chemical properties and initial concentrations of metals. Relationships were obtained which enable evaluation of the degree of heavy metal removal from sewage at aeration plants.--Copyright 1976, Biological Abstracts, Inc.
W76-08580

HYGIENIC SUBSTANTIATION OF THE POSSIBILITY OF WASTEWATER TREATMENT OF POULTRY PROCESSING PLANTS ON UNDERGROUND FILTER BEDS, (IN RUSSIAN),
Meditsinskii Institut, Kiev (USSR).
E. I. Goncharuk, and O. P. Polovtsev.
Gig Sanit. 1, p 95-97, 1975.

Descriptors: *Waste water treatment, *Filtration, *Poultry, Farm wastes, Filters, Underground.
Identifiers: *Underground filter beds.

In an integrated poultry processing plant consisting of 4 poultry farms of 72,000 layers each and each producing 10.5 m3 wastewater daily, underground filter beds with hydraulic loads of up to 40 l wastewater/day per 1 linear meter of irrigation drains network for medium-grained sandy soils are recommended for wastewater treatment.--Copyright 1976, Biological Abstracts, Inc.
W76-08581

BACTERIAL CONTAMINATION OF PERENNIAL GRASSES IN OVERHEAD IRRIGATION WITH SEWAGE, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny, Vilnius (USSR).
A. K. Baubinas.
Gig Sanit. 1, p 97-99, 1975.

Descriptors: *Grasses, *Irrigation practices, *Irrigation effects, Sewage bacteria, *Sewage, E. Coli, Microorganisms, Water pollution.
Identifiers: Enterococci, Perennial grasses.

The bacterial contamination of perennial grasses by Escherichia coli, enterococci and pathogenic microorganisms during and after overhead irrigation with sewage at sewage farms was studied. The bacteria in the sewage during overhead irrigation can be carried far by air currents, leading to massive contamination of the grass. The microorganisms on the plants exposed to direct solar rays generally die off within 1 wk. Grazing of cattle 14 days after irrigation is safe.--Copyright 1976, Biological Abstracts, Inc.
W76-08582

DESALTING HANDBOOK FOR PLANNERS.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 3A.
W76-08584

EVALUATION OF MINERALIZATION PROCESSES FOR SRP WASTES,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5G.
W76-08595

PHOSPHORUS MOVEMENT IN SOILS: SOIL-ORTHOPHOSPHATE REACTION KINETICS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-08672

A FRAMEWORK FOR EVALUATING INSTITUTIONAL AND SOCIO-ECONOMIC ISSUES OF LAND TREATMENT OF WASTE WATER,
Economic Research Service, Upper Darby, Pa.
L. A. Christensen.
Journal of Environmental Quality, Vol. 4, No. 2, p 145-153, April-June 1975. 1 fig, 1 tab, 27 ref.

Descriptors: *Waste water disposal, *Waste water treatment, *Land management, *Institutional constraints, Research priorities, Agriculture, Social aspects, Water reuse.
Identifiers: Land treatment.

Land treatment of waste waters is receiving considerable attention as a waste water management alternative to meet water quality requirements. The many questions raised with the land treatment approach encourage a multidisciplinary planning approach. The systematic investigation of institutional and economic questions should be made concurrent with technical and engineering studies. An investigation of this waste water treatment al-

ternative must address the questions of (i) what institutional arrangements will be used to acquire the use of the necessary land, and (ii) how the land treatment system will be managed. Many factors influence the acreage required for land treatment systems including community size, the type of waste water being treated, management systems used, land availability, and soil type. An extensive area would be required for a large metropolitan area such as Detroit. Smaller communities or power plants would require less area. A number of ways to acquire rights to land are suggested, each with different implications for the affected farmers and the authority responsible for the operation of the system. These include fee simple acquisition, easement purchases, and the formation of waste water cooperatives. Some potential management options for fee simple sites include purchase and manage, and purchase and leaseback. (Skogerboe-Colorado State)
W76-08681

RESOURCE RECOVERY: POSSIBILITIES AND PITFALLS,
International City Management Association, Washington, D.C. Management Development Center.
R. J. Bartolotta.
Solid Wastes Management Vol. 18, No. 11, p. 52, 54, 58, 1975. 2 fig.

Descriptors: *Waste treatment, *Recycling, *Risks, Financing, Project planning, Decision making, Engineers estimates, Marketing.
Identifiers: *Resource recovery.

Basic, non-technical waste recycling implementation questions are discussed. Larger cities generally have a better chance of starting a resource recovery system; economics and market availability for recycled products (especially energy) are important factors in determining feasibility. Building a resource recovery system is expensive and risky, involving more financing, operational, and procurement options than other major capital improvement projects. The approach to major organizational options for resource recovery should be carefully explored and analyzed in terms of each city's needs and constraints. Thorough planning is critical to the success of a resource recovery system, requiring time, manpower, and financing. Requests for proposals should contain specifics about the form, level and organizational level of services. The three most common mistakes which have been made involve markets, choice of consultants, and the development of requests for proposals. Before planning is started, existing facilities should be visited to discuss decision making processes involved in implementation of the system. The EPA's Resource Recovery Division is preparing a resource recovery plant implementation series which will probably include guides on planning for resource recovery implementation and for managing the implementation process. (Buchanan-Davidson--Wisconsin).
W76-08692

REFUSE INTO POWER,
Louisville Univ., Ky. Dept. of civil Engineering.
D. J. Hagerty.
Solid Wastes Management Vol. 18, No. 11, p. 42, 44, 86, 90-91, 1975.

Descriptors: *Recycling, *Solid wastes, *Energy, *Fuels, Byproducts, *Incineration, Design criteria, Steam, United States, Foreign countries, Gases, Oil, Cooling, Heating, Capital cost, Operating costs.
Identifiers: Pyrolysis, Water-tube wall incinerators, Japan, England, Heat reclamation.

The first part of a report on the proceedings of an international symposium on energy recovery from solid wastes held in Louisville, Kentucky, is presented. The background, extent of the energy crisis, and amount of potential energy in refuse are discussed and feasible recovery systems in use are described. If a new energy source can be tapped and its waste products eliminated without detrimental effects, much can be gained. Results with refuse, especially urban solid wastes, are very promising. Solid waste characteristics and systems designed for energy recovery are discussed. One system use as a heat recovery method from refuse is the water-tube wall incinerator. Design considerations in the development of heat recovery plants are given. Pyrolysis is an advantageous method of recovering energy from refuse, since energy can be recovered through heat recovery facilities near the pyrolysis plant fuel (gas, liquid, or char). Waste heat utilization schemes used in Japan, Nashville (Tennessee) and England are described. (Buchanan-Davidson--Wisconsin).
W76-08693

PAPER MAKING WASTE-WATER PURIFICATION.
Netherlands Patent NL 7409-304. Issued January 13, 1976. Derwent Netherlands Patents Abstracts, Vol. X, No. 5, p D1, March, 1976.

Descriptors: Pulp and paper industry, *Waste water treatment, *Patents, *Flocculation, Separation techniques, *Filtration, Recycling, Solids removal, Solid wastes, *Pulp wastes.

Solid components are filtered from paper production waste waters by a patented process. Components consisting of printed waste-paper are flocculated. The flocculate is separated and divided into a fibrous mass and a fiber-free suspension waste materials in water. A filter aid is added which consists of material removed mechanically from the paper pulp before paper preparation. The solid waste material is then separated by filtration or centrifugation. The process recover fibers for addition to the pulp. (Kramer-FIRL)
W76-08695

PRESSURIZED OXIDATION OF PULP SPENT LIQUOR (PARUPU HAIEKI NO KAATSU SNAKA),
T. Kutsuki.
Japan Tappi, Vol. 30, No. 2, p 83-89, February, 1976. 6 fig, 5 tab, 5 ref.

Descriptors: Pulp and paper industry, *Waste water treatment, *Industrial wastes, Pressure, *Oxidation, Liquid wastes, *Pulp wastes.
Identifiers: *Pressurized oxidation method.

A pressurized oxidation method to treat sodium sulfide (Na2S) in weak white, weak black, and strong black liquors from kraft pulp manufacturing processes is described. This method prevents hydrogen sulfide (H2S) formation during the reaction between Na2S and recovery boiler waste gases. In a laboratory experiment at ambient pressure, Na2S oxidation occurred most easily for the weak black liquor and least for the weak white liquor. More than 90% Na2S oxidation was required to eliminate hydrogen sulfide odors. Using a small scale apparatus, the Na2S air-oxidations at various pressure conditions were compared. For the oxidation of weak white liquor containing 6.59 g Na2S/liter, the operating conditions of 6 kg/sq cm G pressure could give more than 90% Na2S oxidation in a 20 minute reaction time at 120 C. For an operation with the same liquor at ambient pressure, 30% Na2S oxidation was achieved in 20 minutes reaction time at 80 C and 120 minutes were required to achieve 90% oxidation. This operation also required a larger air supply. For the oxidation of weak black liquor containing 5.80 g Na2S/liter, the pressurized condition (3 kg/sq cm G) operation gave 99.1% Na2S oxidation by supplying air in an amount 200% of the theoretically required amount, while the ambient pressure operation gave only 67.7% Na2S oxidation. Thus, Na2S oxidation was more efficient when conducted under pressurized conditions than under ambient ones for all three types of liquors. Based on collected data, a commercial scale facility was constructed for the pressurized air-oxidation of Na2S in weak white liquors and strong black liquors. (Katayama-FIRL)
W76-08696

THE LONG HARD ROAD TO THE EFFLUENT-FREE PULP MILL,
D. W. Emmerson.
Chemistry in Canada, Vol. 28, No. 4, p 11-13, April, 1976. 2 fig.

Descriptors: Pulp and paper industry, *Pulp wastes, *Industrial wastes, *Waste water treatment, *Recycling, Water reuse, Effluents.
Identifiers: *Bleaching, *Salt recovery process.

Facilities for the first effluent-free bleached kraft pulp mill will be installed at the Great Lakes Paper Company, Thunder Bay, Ontario, to permit complete recycling of all process effluents. The newly developed Erco Envirotech Salt Recovery process will be implemented and bleach plant effluent will be introduced into the chemical recovery system. The five stages in a pulp bleachery are chlorination, caustic extraction, C102, caustic extraction, and C102. In this system, 70% of the available C12 in the first stage is replaced with C102, thus decreasing the salt load. The replacement gives a stronger and more stable pulp with a higher yield, eliminates the effluent toxicity, and decreases the effluent color by one-half. As an integral part of the new pulp mill, a chlorine dioxide generating system is being installed, with a capacity of 28 tons per day C102. The use of the Salt Recovery process offers a better alternative to conventional primary and secondary waste water treatment. The process recovers salts produced when spent bleaching chemicals are recycled. Cooking liquor is concentrated and purged of contaminating salts. The stages involve evaporation, crystallization, leaching and filtration. Salts can be reused for the manufacture of chemicals and the white liquor is used for pulping. The salt recovery process uses only about one-sixth as much fresh water as a conventional mill and has a net energy saving of 5000 lb of steam per ton of pulp. A typical 900 ton/day mill saves about $4 million per year through its lowered costs for chemicals, water, and energy and its higher pulp yield. (Kramer-FIRL)
W76-08698

BIOLOGICAL PROCESSES FOR EFFLUENT AND WASTE TREATMENT EXEMPLIFIED BY THE PAPER INDUSTRY (BIOLOGISCHE VERFAHREN ZUR ABWASSER- UND ABFALLAUFBEREITUNG AM BEISPIEL DER PAPER-INDUSTRIE),
B. Morgeli, and J. Gnieser.
Gas-Wasser-Abfall, Vol. 56, No. 3, p 135-139, 1976. 7 fig, 1 tab, 10 ref.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Biological treatment, *Industrial wastes, *Waste water treatment, Effluents, Pilot plants, Treatment facilities.
Identifiers: Protein recovery.

A controlled biological process for waste water treatment in the paper industry is described. Fluctuations in the quality and quantity of the effluents, as well as the requirement of protein recovery from the waste water made it necessary to develop a biological process control through the measurement of pH, conductivity, and other readily measurable parameters. A pilot plant developed for this process consists of two aeration basins and a return sludge aeration basin in which the microorganisms of the return sludge are kept viable for repeated use after prolonged interruptions in the waste water supply. (Takacs-FIRL)
W76-08699

THE EFFLUENT TREATMENT SYSTEM AND UTILIZATION OF RECYCLED WATER IN THE IYOMISHIMA MILL (DAIO SEISHI MISHIMA KOJO NI OKERU SOGO HAISUI SHORI TO HAISUI NO SAIRIYO),
K. Murakami.
Japan Tappi, Vol. 30, No. 2, p 76-82, February, 1976. 2 fig, 2 tab.

Descriptors: *Pulp and paper industry, *Recycling, *Waste water treatment, *Pulp wastes, *Industrial wastes, Treatment facilities, Chemical oxygen demand.

The waste water recirculation system in operation at the pulp and paper mill of the Taio Paper Manufacturing Co., Japan, is described. The mill uses 300,000 cu m/day water to produce 5100 tons of paper-pulp products; this consists of 270,000 cu m/day waste water plus 30,000 cu m/day evaporation loss. Of the waste water generated, 100,000 cu m/day is recirculated and 200,000 cu m/day discharged to the sea. Waste waters from individual mill processes are combined and treated by two independent systems. The waste water treated by the first system is not recirculated, and all of the water treated (100,000 cu m/day) by the system is discharged to the sea. The system utilizes a precipitation method with primary and secondary clarifiers. The second system, which treats 170,000 cu m/day waste water, consists of a first settling basin, an aeration basin, a secondary settling basin, and a clarifier. Of the water treated by this process, 70,000 cu m/day is discharged into the sea, together with the water treated by the first system; the other 100,000 cu m/day are recycled. The average quality of the mill-generated water before treatment is SS, 460 ppm; COD, 520 ppm; and BOD, 250 ppm. The quality of the water discharged to the sea is pH, 6.7; SS, 37 ppm; and COD, 123 ppm; the recirculating water quality averages pH, 5.7; SS, 37 ppm; COD, 70 ppm; and BOD, 20 ppm. (Katayama-FIRL)
W76-08700

RECYCLING--EXAMPLES FOR ITS POSSIBILITIES AND LIMITS (RECYCLING--BEISPIELE FUER MOEGLICHKEITEN UND GRENZEN),
A. Hackl.
Oeterreichische Chemie-Zeitschrift, Vol. 77, No. 1, p 1-5, January, 1976. 4 fig, 3 tab, 9 ref.

Descriptors: *Industrial wastes, *Recycling, *Water reuse, Acids, Rivers, Waste disposal, *Pulp wastes, Waste water treatment, *Europe.
Identifiers: Sulfuric acid, *Lenzinger process.

Problems and possibilities of waste recycling in Europe are reviewed. Dilute sulfuric acid, generated as a by-product in many chemical processes, can be concentrated for reuse to 70% and more by the Chemico immersion heater method. The use of this method is, however, often limited by the costs involved. Sulfuric acid waste with concentrations under 10% is often dumped in rivers or at sea. A recycling rate of 80% can be achieved by the Lenzinger process for the recycling of magnesium disulfite in pulp-making. (Takacs-FIRL)
W76-08701

CHEMICAL CLARIFICATION OF WASTE WATER.
Belgian Patent BE 831-077. Issued November 3, 1975. Derwent Belgian Patents Abstracts, Vol. W, No. 49, p D3, January, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Oil, *Chemical precipitation, Flocculation, Sedimentation, Sludge treatment, *Recycling.
Identifiers: *Chemical clarification, *Chemical treatment.

A process for the chemical treatment of waste water has been patented in which the resulting precipitate is dissolved to provide soluble salts for recycling in a clarification process. Industrial effluent is clarified with an agent such as A1(OH)3, Fe(OH)3 or CaCO3. In a clarification tank, the agent is added to the effluent together with a solution of salt containing the cation of the clarification agent. For example, with CaCO3 as the clarifier, the salt would be CaC12. The solution is introduced to provide 10 to 100 g salt/cu m. The precipitate from the bottom of the tank is piped to a dissolving tank and treated with an organic acid or detergents to form soluble salts of the clarification agent. Then, 80% or more of this solution is recycled to the clarification tank and the balance of the solution is drained off. Floating hydrocarbons are skimmed from the surfaces of both the dissolving and clarifying tanks and can be removed by adsorption on synthetic resins. The effluent may be purified to the quality of potable or industrial water. (Kramer-FIRL)
W76-08702

FLUORIDE REMOVAL: TECHNOLOGY AND COST ESTIMATES,
C. L. Parker, and C. C. Fong.
Industrial Wastes, Vol. 21, No. 6, p 23-27, November/December, 1975. 6 fig, 4 tab, 9 ref.

Descriptors: *Industrial wastes, *Fluorides, Laboratory tests, *Waste water treatment, Metals, *Chemical precipitation, *Lime, *Adsorption, Costs.
Identifiers: *Fluoride removal.

Fluorides are removed from waste water most efficiently and economically at the highest practical concentration and the lowest waste water volume. The treatment technology and costs for the removal of fluoride in concentrations between 20 mg/liter and 100 mg/liter have been evaluated. Soluble fluorides occur in a variety of industrial waste waters for discharge to navigable water ways, including electronics and ceramics manufacture, and the glass, aircraft, and metals industries. Three types of treatment technology investigated in the laboratory were: lime precipitation of calcium fluorides; alum treatment; and adsorption of fluoride on alumina. Findings revealed that lime treatment costs and the residual fluoride levels achieved for dilute solutions were dependent upon both pH level and other dissolved ions. Optimum pH level must be chosen on the basis of specific need. Once minimum fluoride levels achievable by lime addition are obtained, further reduction may be attained by using either alum or alumina adsorption. Fluoride removal by lime and alum is possible down to one to four mg/liter residual fluoride. Below about ten mg/liter, residual fluoride alumina treatment costs are close to those for lime treatment. (Kramer-FIRL)
W76-08703

THE EFFECTIVE MANAGEMENT OF WASTE.
Australian Chemical Engineering, p 15-19, November/December, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Waste treatment, Cost-benefit analysis, *Recycling, Metals, Toxicity, Oily water, Europe, Management.

Three approaches to waste management in European countries are discussed. These are the reduction of the total quantity of waste generated, the extraction of maximum benefit from waste materials, and the elimination of environmental hazards associated with waste disposal. Examples of the waste management problems common to several industries are provided. These include those wastes from packaging industries, including glass, metals, paper, cardboard, plastics, wood and textiles; from livestock rearing; from metal fabricating operations; from solvents in the paint and pharmaceutical industries; and from the oil refining, storage, and transporting industries. Certain waste materials, such as scrap iron, are presently marketed. Other wastes, including oils, have a potential market value, often not realized. Toxic and hazardous wastes have only a negative value. Policy instruments in the management of industrial wastes include direct regulation and economic incentives, such as the taxation of those groups which generate wastes or the subsidizing of groups which engage in effective waste treatment and disposal. (Kramer-FIRL)
W76-08704

PURIFYING-DEMICROBISING WASTE-WATER.
Netherlands Patent NL 7508-499. Issued February 2, 1976. Derwent Netherlands Patents Abstracts, Vol. X, No. 7, p D1, March, 1976.

Descriptors: *Waste water treatment, *Microorganisms, *Organic compounds, *Patents, *Pulp wastes, Textiles, *Industrial wastes, *Biodegradation, Color, *Bacteria.
Identifiers: Lactic acid bacteria.

A method has been patented for removing pathogenic microbes and dissolved organic materials from various effluents, including those from paper mills, textile mills, and glue works. Lactic acid bacteria are added to the liquid and the temperature and pH of the liquid are controlled so as to promote bacterial growth. This process efficiently destroys pathogenic bacteria and biologically degrades organic materials in the heavily polluted waste water. The treated water will be colorless, neutral, and practically microbe-free. (Kramer-FIRL)
W76-08705

THE ELECTROLYTIC PROCESSING OF CYANIDE WASTES,
J. E. Entwistle.
Effluent and Water Treatment Journal, Vol. 16, No. 3, p 123-128, March, 1976. 4 fig, 3 ref.

Descriptors: *Waste water treatment, Metals, Waste disposal, Heat treatment, *Electrolysis, Oxidation, Pilot plants, Laboratory tests, *Industrial wastes, *Treatment facilities.
Identifiers: *Metal finishing industry, *Cyanide wastes.

Cyanide-containing wastes produced in the engineering and metal finishing industries include electro-plating wastes and heat treatment salt residues (HTR). An investigation of various means of disposing of these wastes, in particular the HTR wastes, was conducted. Methods compared included incineration, biological treatment, combustion of HCN liberated by acid addition, chlorination at high pH, and electrolytic oxidation. Of these methods, electrolytic oxidation seemed to be the most cost-effective. Electrolytic oxidation also had the advantages over the other methods investigated in that heavy metal recovery appeared to be possible as a parallel cathodic process within the system. A series of laboratory and pilot plant studies were done. On the basis of these trials, a 5000 amp closed cycle installation for the processing of heat treatment salt residues was constructed. The installation consisted of the four stages of spray dissolution, settlement, electrolysis, and cyrstallization. After six months of operation, data were accumulated for the development of a more advanced 5000 amp variable geometry unit, capable of simultaneous cyanide destruction and metal recovery. The process has been shown to produce a final effluent substantially free from heavy metals; copper, zinc, or cadmium present in the electrolyte plates out on the cathode and is recoverable. Additionally, the electrolytic oxidation process is effective in treating metal cyanide complexes such as tetracyanonickelate and hexacyanoferrate. (Kramer-FIRL)
W76-08706

STUDIES CONCERNING OIL REMOVAL FROM MILL SCALE (UNTERSUCHUNGEN ZUR ENTOELUNG VON WALZZUNDER),
A. Supp, and K. Zimmermann.
Technische Mitteilungen Krupp Forschungsberichte, Vol. 33, No. 3, p 89-92, 1975. 3 fig, 2 ref.

Descriptors: *Industrial wastes, *Waste water treatment, Oily water, *Metals, *Oil wastes, Costs, *Recycling, *Separation techniques, *Centrifugation.
Identifiers: Rolling mills, Mill scales.

A method for oil removal from mill scale retained on gravel filters in a hot broad strip roll mill is described. The dilute sludge obtained during the scavenging of the gravel filter undergoes preliminary dewatering, after which it is treated with alkaline detergents at high temperature in a mixing tank. After phase separation, the solid particles (mill scales) are separated by centrifugation and recycled in the ore dressing process. Oil suitable for recycling in the rolling process is recovered. The specific cost amounts to 35 DM/ton of treated scale. (Takacs-FIRL)
W76-08707

CLEARING OF TITANIUM- AND ALUMINIUM-CONTAINING EFFLUENT WATERS.
Belgian Patent BE 831-477. Issued January 19, 1976. Derwent Belgian Patents Abstracts, Vol. X, No. 7, p D3, March, 1976.

Descriptors: *Patents, *Chemical wastes, Chemical industry, *Chemical precipitation, *Industrial wastes, *Waste water treatment, *Aluminum, Flocculation.
Identifiers: Polyalkene production wastes, *Titanium.

Treatment of titanium- and aluminum-containing effluent waters is effected by a patented method. These effluents, from polyalkene production using Ziegler catalysts, are treated by adjusting the pH to between 4.5 and 9.5 and separating the resulting aluminum- or titanium-containing precipitate. The process is necessary to prevent the build up deposits of titanium and aluminum salts in the pipework and pumps of treatment units of polyalkene production plants. The pH is adjusted with the use of HC1, H2SO4, NaOH, or Na2CO3 and the precipitation of the titanium and aluminum compounds is promoted with the addition of a flocculant such as 0.5 to 1% of a polyacrylamide. (Kramer-FIRL)
W76-08708

ELECTROLYTIC PURIFICATION OF TRADE EFFLUENTS CONTAINING TOXIC MATERIALS,
A. Paudrat.
French Patent 2265-691. Issued November 28, 1975. Derwent French Patents Abstracts, Vol. X, No. 3, p D5, February, 1976.

Descriptors: *Patents, *Waste water treatment, *Toxicity, *Metals, *Industrial wastes, Treatment facilities, Equipment, Oxidation, Measurement, *Electrolysis, Ions.
Identifiers: Hexavalent chromium ions, Cyanides ions.

A method has been patented for the continuous treatment of effluents containing soluble toxic molecules, such as cyanide and hexavalent chromium ions. In this electrolytic process, effluent is introduced under pressure into the outer tank of a system of three concentric vertical cylindrical tanks with a common base. The pH is measured by electrodes and adjusted. Liquid overflows from the outer to the intermediate tank and then through ports to the center tank. Electrodes measure the oxidation-reduction potential and compressed air is introduced through a perforated pipe to stir the reacting materials. The cyanide ions are destroyed by oxidation with oxygen, ozone, or hypochlorite; hexavalent chromium is reduced to non-toxic trivalent chromium by ferrous sulfate and alkali sulfites and bisulfites. Treated effluent is fed to a settlement tank. (Kramer-FIRL)
W76-08709

HIGH-GRADIENT MAGNETIC FILTRATION OF STEEL PLANT WASTE WATER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
M. J. McNallan, K. C. Russell, J. A. Oberteuffer, and J. B. See.
Iron and Steel Engineer, Vol. 53, No. 1, p 40-44, January, 1976. 4 fig, 1 tab, 13 ref.

Descriptors: *Industrial wastes, *Steel, *Iron, *Filtration, *Separation techniques, *Waste water treatment, Suspended solids.
Identifiers: *Magnetic filtration.

Laboratory tests showed that high-gradient magnetic separation, a technique which permits removal of weakly magnetic, micro-size particles from water at higher process flow rates than conventional technologies, is effective in removing fine ferromagnetic iron oxide solids from steel plant waste water. A bench scale magnetic separator was used to clean samples from blast furnace wash water and oxygen furnace evaporation chamber water, achieving 5 to 20 ppm suspended solids at process flow rates of 18 to 200 gpm/sq ft. For certain effluents, the suspended solids concentration of the dust bearing waste water was reduced to less than 5 mg/liter with a single pass through the separator. Suspended solids concentration in the raw gas cleaning water could be reduced by more than 99%. Chemical flocculant additions were not necessary. Experiments were also performed on the high-gradient magnetic separation for removing iron fines from cold rolling mill lubricant emulsions. Although the technique was found to be effective, further experiments are needed to evaluate the effects of the storage and shipment conditions of the emulsion on the magnetic separation efficiency. Larger scale testing of high-gradient magnetic separation for steel mill and process waste water is planned. (Kramer-FIRL)
W76-08710

INDUSTRIAL WASTE TREATMENT SYSTEM REDUCES POLLUTION,
Sherwood Medical Industries, Inc., Waterbury, Conn.
J. Klancko, R. B. Jones, and M. Michalak.
Industrial Wastes, Vol. 22, No. 1, p 27-29, January/February, 1976. 1 fig, 3 tab.

Descriptors: *Waste water treatment, *Metals, *Plastics, *Industrial wastes, Liquid wastes, Treatment facilities, Organic compounds, Filtration, Chemical precipitation, Water treatment, Waste treatment, Connecticut.

A system has been developed to treat various types of process wastes from the Sherwood Medical Industries Plant in Waterbury, Connecticut. Manufacturing operations such as burnishing, grinding, metal finishing, and non-contact cooling, produce waste streams containing large amounts of nitric acid, copper, abrasive grit, and metal fines. The basic treatment system involves conventional equalization, neutralization by means of lime slurry, clarification, and final filtration. In order to conserve water, uncontaminated non-contact cooling water has been routed to serve grinding operation. Grinding and finishing wastes are combined for treatment. Burnishing waste water, containing biodegradable organics, is routed to the sanitary sewerage system. Solids disposal and air pollution control are integral parts of the waste water treatment system. In the disposal of solids, clarifier underflow is pumped to a vacuum filter; cake is discharged to a conveyor and transferred to a scrap hopper. Grinding waste solids are associated with the filter cake and removed concurrently. The high copper content of the filter cake assures profitable sale. The total system for water, air, and solids removal results in a reduction in pollution and in the saving and reclamation of previously unrecoverable materials. (Kramer-FIRL)
W76-08711

MUNICIPAL INDUSTRIAL WASTE PROGRAM NETS $8.9 MILLION IN TWO YEARS.
Water and Sewage Works, Vol. 123, No. 4, p 84-88, April, 1976. 4 fig, 5 tab, 1 ref.

Descriptors: *Waste water treatment, *Sewerage, *Industrial wastes, *Municipal wastes, *Treatment facilities, *Costs, Legislation, California, Water quality control.
Identifiers: Municipal-industrial wastes, Sewer charges, *Combined treatment.

The 27 Sanitation Districts of Los Angeles County, California provide combined municipal and industrial sewerage service. Since 1972 when a waste ordinance was passed, industrial companies must reimburse their districts for waste water treatment costs. A quantity-quality surcharge structure was established, based on the charge parameters of total waste water flow, chemical oxygen demand, suspended solids, and peak flow. Peak flow charges reimburse the district for short term industrial use of the sewerage system and encourage the industries to discharge waste water during daily low flow periods. Monitoring for quality and measurement for quantity of waste water is required; the various flumes and weirs used are described. Engineering specialists from each of the six major contributing industries--petroleum production and refining, food processing, fibers, metal plating and toxic wastes, chemical processing, and primary metals--provide expertise in basic industrial areas, permitting close cooperation between the Districts and the major industrial dischargers. (Kramer-FIRL)
W76-08712

INDUSTRY TAKES THE LEAD IN CLEANING UP THE RHINE.
Surveyor, Vol. 147, No. 4367, p 24, 27, February 20, 1976.

Descriptors: Rivers, Toxicity, Waste disposal, *Waste water treatment, *Industrial wastes, Chemical industry, *Chemical wastes, Municipal wastes, *Treatment facilities, Sewerage.
Identifiers: Municipal-industrial wastes, *Rhine River(West Germany), *Combined treatment.

A new effluent treatment plant has been built by BASF at Ludwigshafen, West Germany, to treat both the waste water from the large chemical manufacturing facility and from the cities of Ludwigshafen and Frankenthal. The site has been occupied for over 100 years, and the old sewerage system had to be replaced with a dual system. Sewage from Ludwigshafen city and the BASF plant is collected by an interceptor sewer and treated with a lime solution. Sewage from Frankenthal also enters the system after coarse solids have been removed by screening; the sewerage is then filtered through a fine rack and is passed to four primary settlement tanks for the short retention time of 10 to 12 minutes. Activated sludge aeration then proceeds for 12 hours, followed by sludge thickening, dewatering, and incineration in fluidized bed furnaces. Ash is dumped to an island area, where the site will eventually be landscaped. The combined treatment plant has reduced BOD by 95% and COD and TOC by 80%. Discharge to the Rhine river is not yet of potable water quality, but industrial effluent which contains heavy metals is pre-treated and research into further purification is being conducted. (Kramer-FIRL)
W76-08713

AUSTRIAN EXPERIENCES CONCERNING DAMAGES OF COMMUNAL PURIFICATION FACILITIES BY INDUSTRIAL EFFLUENTS (OSTERREICHISCHE ERFAHRUNGEN BETREFFEND SCHADEN AN KOMMUNALEN KLARANLAGEN DURCH INDUSTRIEABWASSER).
W. Biffl.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 137-153, 1976. 9 fig, 15 tab, 4 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Industrial wastes, Municipal wastes, Water pollution control, Biological treatment, Dyes, Copper, Pulp wastes.
Identifiers: Municipal-industrial wastes, *Combined treatment, Austria.

Examples are presented of municipal waste water treatment plants in Austria that were overloaded by industrial effluents causing a reduction in purification efficiency or disturbances in plant operation. Such disturbances were due mainly to effluents from canning plants, tanneries, breweries, and wood processing plants, even though the nutrient ratios were usually within normal limits. It was usually possible to resume normal operation at high efficiency after adequate pre-treatment of the industrial effluents. Occasionally a flocculating agent, such as iron sulfate, was added in the aeration basin. In one case, high copper contents in an industrial waste water caused corrosion of the pipings. In another case, the high kaolin load of paper mill effluents rendered the sludge digester inoperable. Biological treatment plants also proved to be inefficient in the degradation of dyes and related substances. (Takacs-FIRL)
W76-08714

OXYGEN, AND OTHER INNOVATIONS, HELP LICK TOUGH WASTE PROBLEM,
Manganaro (Charles A.), New York.
M. Safhay.
Water and Wastes Engineering, Vol. 13, No. 3, p 30-31, 50, March, 1976.

Descriptors: *Industrial wastes, *Sewage treatment, *Oxygen, Biochemical oxygen demand, Activated sludge, Suspended solids, Municipal wastes, Odor, *Treatment facilities, New Jersey, Oxidation, *Aeration.
Identifiers: Municipal-industrial wastes, *Combined treatment.

The sewage treatment plant of the Passaic Valley Sewerage Commission at Newark, New Jersey, also treats wastes from 3000 area industries. In order to meet EPA standards for BOD and suspended solids, a system was designed for an oxygen utilizing activated sludge treatment which removes 93% BOD and suspended solids from an average flow of 300 mgd and combined peak flows of up to 720 mgd. To accomplish this, the facility produces 1000 tons of oxygen a day for its twelve 30-ft deep aeration tanks; has an extremely large Archimedes screw pump, 12.5 ft in diameter and 70 ft in length; is capable of applying 120 tons chlorine per day; uses a unique air injection conveyor system controlled by computers to transport and measure the screenings and grit from the plant; and utilizes 3000 hp outfall pumps to handle combined flows of up to one billion gpd. A 25-mile system collects and carries intercepted sewage to the plant. Treated effluent is carried through a six-mile outfall system and discharged below mean tidal level in New York harbor. New screening and grit chamber units have been designed and automated, as well as grease skimming devices. Odor removal facilities have also been added. Additional facilities are under construction and the entire plant will be in full operation by 1982. When completed, the plant will consist of 12 primary clarifier/oxygenation tank/final clarifier/sludge treatment tank units, each to handle average flows of 25 mgd. (Kramer-FIRL)
W76-08715

TREATMENT OF DYE WASTES WITH GRANULAR ACTIVATED CARBON,
ICI United States, Inc. Wilmington, Del.
P. B. DeJohn, and R. A. Hutchins.
Textile Chemist and Colorist, Vol. 8, No. 4, p 34-38, April, 1976. 8 fig, 7 tab, 16 ref.

Descriptors: *Textiles, *Color, *Activated carbon, *Industrial wastes, *Dyes, Adsorption, *Waste water treatment, Recycling, Waste treatment.

Dye wastes from the textile industry can be successfully treated using granular activated carbons. Information is presented on physical properties of lignite and bituminous coal carbons and the relationships between dye molecular weight and carbon adsorption in order to aid in the selection of a carbon system. The major design parameter for adsorption is the contact time between the waste water and the carbon necessary for purification. Size of the adsorber or carbon bed is based on this contact time. Design parameters for regeneration are carbon usage or regeneration rate required to maintain acceptable effluent from the plant and residence time in the furnace required to restore adsorptive properties. High molecular weight dyes are adsorbed in the transitional pores of an activated carbon while low molecular weight dyes are adsorbed in the micropores. The effect of thermal regeneration may be to drastically reduce the surface area in the micropores of an activated carbon. Lignite carbon properties are not changed as much as bituminous coal carbon properties as a result of thermal regeneration. These factors should be considered in order to avoid undersizing a carbon system. (Kramer-FIRL)
W76-08716

A MODIFIED RAW-WOOL SCOURING SYSTEM FOR EASIER EFFLUENT TREATMENT,
Commonwealth Scientific and Industrial Research Organization, Belmont (Australia). Div. of Textile Industry.
G. F. Wood, and C. A. Anderson.
Textile Institute and Industry, Vol. 14, No. 3, p 87-89, March, 1976. 2 fig, 3 tab, 7 ref.

Descriptors: *Textiles, *Industrial wastes, *Waste water treatment, Waste disposal, Recycling, Centrifugation, Detergents, Scour.
Identifiers: *Scouring(Raw wool).

A modified raw wool scouring system was evaluated. In this process, a scouring machine with a very high concentration of contaminants in the first bowl is operated, thus reducing the water consumption to a low figure. Discharge would therefore be a small volume of liquor carrying a high pollution load, and disposal of the concentrated waste would be easier than with conventional scouring processes. Results of experimental scouring runs showed that the low water consumption process was quite feasible, but would require special equipment. The system would discharge a liquor with a solids concentration of 20 to 30%; this could be incinerated economically without further treatment. The process would cost only half as much as other processes to achieve total effluent disposal. Additionally, higher grease recoveries could be achieved due to the destabilizing effect of the high detergent concentrations. (Kramer-FIRL)
W76-08717

CLEANING OF INDUSTRIAL EFFLUENT,
A. V. Fokin, S. Shifrin, and A. B. Zlotnikov.
Soviet Patent SU 435-196. Issued July 28, 1975.
Soviet Inventions Illustrated, Vol. X, No. 2, p D1, February, 1976. 1 fig.

Descriptors: *Waste water treatment, *Chemical wastes, *Textiles, *Color, *Patents, Industrial wastes, Dyes, Oxidation, Equipment, *Cleaning.

A method has been patented for the treatment and decolorization of textile effluent. An effluent homogenizer, an oxidizer, a reactor, a neutralizer, and a settling tank are used. To increase the decoloring effect, a rectangular sectional reactor tank with cleaning sections containing iron-chip blocks is employed. The arrangement comprises an aerating installation, a foam remover, a foam condensation chamber, and a spent effluent chamber. Ninety to 95% of the textile dye is contained in only 20% of the total effluent. This portion is passed to the homogenizer non-uniformly over time at different concentrations of impurities and pH. Following homogenization, the material is cooled in heat exchangers from 80 to 90 C to 3 to 40 C. Cooled effluent enters the reactor after treatment; the pH is adjusted to below 3; and the effluent flows into various cleaning sections in turn. Contact with chips in the reactor deoxidizes organic dyes, giving amino compounds which mineralize in alkaline medium. Water from the reactor enters the neutralizer, where pH is adjusted to between 8.5 and 9. It then enters a gravity settler for final breakdown of the dye structure. Total decolorization efficiency is 98%; synthetic surfactant removal is 70 to 75%; reduction in organic material content is 70%; and reduction in suspended solids concentration is 60%. (Kramer-FIRL)
W76-08719

CANTON'S FUTURISTIC WASTE TREATMENT SYSTEM,
S. M. Suchecki.
Textile Industries, Vol. 140, No. 3, p 43-46, 49, March, 1976. 1 fig.

Descriptors: *Textiles, *Industrial wastes, *Waste water treatment, *Dyes, Color, Dissolved oxygen, Biochemical oxygen demand, Recycling, Water reuse, Alabama, Treatment facilities.
Identifiers: Caustic recovery, Indigo dyes.

Siluria Textile Mills, a manufacturer of indigo-dyed denim, has upgraded its waste water treatment facilities to meet Alabama water quality standards, using an interim system. In addition, a future system has been built and is operating on a pilot plant scale. Called WWTS/100, the system uses a special design for an electrodialysis unit to reduce pH and extract caustic and an electrolysis cell and flotation unit to remove indigo dye. The system will recycle not only the expensive indigo dye but also the hot process water and caustic. When in full operation, it will have a daily capacity of 100,000 million gallons. Both the interim treatment system and the WWTS/100 system screen dye waste to remove lint and grit. In the interim method, alum is added to neutralize caustic soda, indigo dyestuff is flocculated through 20 electrolysis units in the presence of alum, and water used is filtered, stored, and recycled, with only 50% of the water being reused in the rinsing section of the dye range. With WWTS/100, waste is passed through an electrodialysis unit to extract caustic soda for recovery and recycling. The pH is reduced from 11.5 to 6.5 without the addition of alum. Electrolysis is then accomplished in a single cell with a small alum addition and the indigo dye flocculant undergoes flotation for recovery and dewatering before recycling. About 75% of the water is filtered, stored and reused. Both systems use Bio-Trac activated sludge treatment, aeration lagoons, and effluent measuring and sampling combinations. (Kramer-FIRL)
W76-08720

RE-USE AND DISPOSAL OF WASTE ACIDS,
Hoeschst A. G., Frankfurt am Main (West Germany).
G. Theilig, G. Muller, and K. Hodenbenner.
Israel Journal of Chemistry, Vol. 14, p 234-243, July, 1975.

Descriptors: *Waste disposal, *Recycling, *Industrial wastes, *Acids, Evaporation, Oxidation, *Chemical wastes, Waste treatment.

Identifiers: Hydrochloric acid, Sulfuric acid, *Thermal degradation.

Several processes for the recycling and disposal of waste acids in the chemical industry are presented. The two main waste acid by-products are hydrochloric acid and sulfuric acid. Hydrogen chloride can be converted to chlorine by oxidation or by electrolysis of muriatic acid. Hydrochloric acid is also useful in the synthesis of such chlorohydrocarbons as vinyl chloride, methyl chloride, and chloroprene. While these methods to recycle waste hydrogen chloride start from a relatively pure chemical, the situation regarding sulfuric acid wastes are more varied. Sulfuric acid may be used as a solvent, condensating agent, or a water separating agent. It accordingly reappears as a by-product, diluted with water and contaminated by organic and inorganic substances. Major sources of waste sulfuric acid are the manufacture of titanium dioxide, pickling of steel, concentration of nitric acid, oil refining, and manufacture of organic intermediates. The disposal method for waste sulfuric acid depends upon water content of the acid. Such methods include dumping either directly or after neutralization, concentration and recycling, and production of sulfur dioxide by thermal decomposition. The latter method is often used for the disposal of oil refinery sludges, and is accomplished by either spraying the waste into a hot combustion chamber or by adding the waste to circulating granular coke. In addition to hydrochloric acid and sulfuric acid, several other waste acids are important to the chemical manufacturing industry. These include organic acids or their anhydrides which appear as volatile substances in exhaust gases to be removed by scrubbers, hydrogen bromide which is treated with a method similar to that of hydrogen chloride oxidation, and phosphoric acid which must be neutralized prior to disposal. (Kramer-FIRL)
W76-08721

METHANE FERMENTATION OF RUBBER (HEVEA BRASILIENSIS) LATEX EFFLUENT,
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat.
K. Rajagopalan.
Canadian Journal of Microbiology, Vol. 22, No. 3, p 342-346, March, 1976. 1 fig, 1 tab, 20 ref.

Descriptors: *Methane, *Rubber, *Industrial wastes, *Anaerobic digestion, Effluents, Chemical wastes, *Fermentation.
Identifiers: *Rubber latex effluent.

Rubber factory effluent, produced from natural product processing in Malaysia, has a very high BOD and thus its treatment and disposal have caused serious pollution problems. Studies were made of the technique of methane fermentation of the effluent, to produce solids which can be recovered by sedimentation, facilitating the possible processing of the solids as a protein source and the individual treatment of the supernatant liquid phase. Twenty-one bacterial species were tested for their ability to ferment rubber latex effluent. Of these, four species capable of methane fermentation were isolated and identified as Methanococcus, a strain of M. vannielli, a Methanobacterium, and a strain of M. omelianskii. Results suggest that reduction of carbon dioxide and fermentation of acids formed during metabolism of the latex are possible pathways of methane production. (Kramer-FIRL)
W76-08722

USE OF SURFACE-ACTIVE CHEMICALS IN PUMP-ASHORE SCHEMES AND SUCTION DREDGERS,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 8C.
W76-08747

5E. Ultimate Disposal Of Wastes

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES, GENERAL REPORT, VOLUME I,
Wahler (W. A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-08143

PROCESS FOR THE ENVIRONMENTALLY FAVORABLE DESTRUCTION OF SOLID AND/OR LIQUID CYANIDE WASTE,
Deutsche Gold- und Silber-Scheideanstalt A. G., Frankfurt-am-Main (West Germany). (Assignee).
For primary bibliographic entry see Field 5D.
W76-08208

OXYGEN RELATIONSHIPS IN A SOIL TREATED WITH SEWAGE EFFLUENT,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W76-08231

TRIVALENT CHROMIUM IN TANNERY EFFLUENTS,
Instituut TNO Leder en Schoenen, Waalwijk (Netherlands).
For primary bibliographic entry see Field 5D.
W76-08295

GUIDELINES FOR MATERIAL PLACEMENT IN MARSH CREATION,
Center for Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 5G.
W76-08325

EFFECTS OF GRAZING ON INFILTRATION RATES IN WASTE WATER SPRAY FIELDS,
West Virginia Univ., Morgantown. Div. of Plant Sciences.
G. A. Pearson, G. A. Jung, R. E. Fowler, and D. M. Mitchell.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p. 954-957, 1975. 1 fig., 2 tab., 26 ref.

Descriptors: *Grazing, *Infiltration, *Waste water disposal, *Spraying, *Pastures, Food processing industry, Waste water treatment, Soils, Harvesting, Maintenance costs, Soil compaction, Forage palatibility.
Identifiers: *Grassed sprayfields.

To eliminate periodic mowing costs of effluent spray fields used by food processors, the effects of pasture on soil infiltration rates were measured. A waste water treatment field was grazed for 150 days from June-November by six Hereford steers for two successive years. The soil was Sassafras sandy loam and the grass 'Kentucky 31' tall fescue and orchardgrass. The infiltration rate at saturation was measured frequently during the grazing period. Trampling progressively reduced the infiltration rate from 2-2.5 cm/hr to about 0.3 cm/hr. These results indicate that when the soil is saturated, applications of water (waste water and/or rainfall) in excess of 0.3 cm/hr will result in runoff. Infiltration also remained low the following year. Lower stocking rates or different grazing management procedures may have a lesser effect on infiltration rates. An alternative would be to use the nutritive value of the grass by mechanically harvesting it as green-chop for cattle feed as it has been demonstrated that cattle prefer grass cut from a canning effluent spray field to that of the same species cut from other areas. (Buchanan-Davidson--Wisconsin)
W76-08352

METHOD AND APPARATUS FOR DRYING MOISTURE-CONTAINING SOLIDS, PARTICULARLY DOMESTIC REFUSE AND SLUDGE CAKES,
For primary bibliographic entry see Field 5D.
W76-08404

PROCESS OF PREPARING SEWAGE SLUDGE FOR DEWATERING,
Envirotech Corporation, Menlo Park, CA (Assignee).
For primary bibliographic entry see Field 5D.
W76-08409

LAND TREATMENT OF FOOD PROCESSING WASTEWATERS,
Campbell Soup Co., Camden, N. J. Environmental Engineering Dept.
L. C. Gilde.
Journal of the Irrigation and Drainage Division, Proceedings of ASCE, Vol. 99, No. IR3, p 339-352, September, 1973. 9 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Waste water disposal, Irrigation, Food processing industry, Infiltration, *Water reuse, Impervious soils.
Identifiers: Overland irrigation, Spray irrigation.

Spray irrigation for waste water disposal is widely used throughout the food processing industry. The use of this technique is usually limited to soil areas with high filtration capacity and thus the purified water is usually lost to the original user. The Campbell Soup Company system at Paris, Texas, employs the overland flow technique whereby water is applied to impervious soil and the purified effluent is collected at the foot of a vegetative slope. Consideration can be given to the collection and reuse of water from this type of system. At the Sumter, South Carolina, facility, a 5- to 7-foot layer of sandy soil with a high infiltration rate is underlin by a relatively dense substrata. The water after pretreatment is sprayed through a sprinkler system, falls on land which has been planted with special grasses, and infiltrates through the ground. It is picked up by underground perforated pipes and conducted to a final polishing pond and savanna. (Sandoski-FIRL)
W76-08468

TREATMENT OF PHOTOGRAPHIC FERROCYANIDE-TYPE BLEACH SOLUTIONS FOR REUSE AND DISPOSAL,
Computerized Pollution Abatement Corp., Leicester, N. Y.
For primary bibliographic entry see Field 5D.
W76-08472

NEW INCINERATION METHOD SOLVES GREASE PROBLEM IN RICHMOND, PA.,
Philadelphia Water Dept., Pa. Northeast Water Pollution Control Plant.
M. S. Cameron.
Water and Sewage Works, Vol. 120, No. 9, p 116-119, September, 1973. 3 fig.

Descriptors: *Waste disposal, *Chemical wastes, *Industrial wastes, *Waste water treatment, *Incineration, Oxygen, Oil wastes, Pennsylvania.
Identifiers: *Watergrate incinerator, Grease.

A method of waste disposal of grease from chemical, wool scouring and drying plants, and slaughterhouses has been developed in Philadelphia, Pennsylvania. The solution was to stop burning the grease in an open pit that contaminates the air, and to use a new furnace that can consume an estimated 1.6 million gallons per year of grease, scum, rags, and other floatable. Grease and other skimmings are piped into the base of the incinerator, which is an open-topped, water-tight compartment. Here the grease floats to the surface and comes in contact with an auxiliary gas burner

flame. The grease is exposed simultaneously to air blown at it by a fan. The combination of heat and oxygen causes ignition. Because high temperatures are generated, most surface material is reduced to CO2 and water. One unusual aspect of the incinerator is that the water functions as the grate. The Watergrate consists of five sections: a tank or water hearth, and ignition chamber, a lower combustion, an upper combustion chamber and a stack. The incineration process produces carbon dioxide and water, with almost no residual ash. Using the Watergrate, an operator manually skims the concentration tank and packs the grease/sludge mixture into a screw conveyor. Instead of ejecting the skimmings into the lagoons, they go to the furnace where heat causes the grease to melt, releasing some of the sludge to settle out. While sludge still adheres to the grease, the high temperatures generated cause it to simply burn up along with the floatables. (Sandoski-FIRL)
W76-08485

DEWATERING VEGETABLE WASTE.
Water and Waste Treatment, Vol. 16, No. 8, p 31, August, 1973.

Descriptors: *Food processing industry, *Waste disposal, *Dewatering, *Filters, Flocculation, *Industrial wastes, Filtration.
Identifiers: Vegetable waste, Polypropylene.

Pierson and Company, Limited, of Manchester, England, have developed a new application of an industrial filter, designed for the dewatering of vegetable waste. This horizontal belt filter delivers dry cake continuously, filters heavy fast settling slurries and fragile flocculated material, has continuous belt washing, and carries out cocurrent or counter-current cake wash. It is constructed of standard polypropylene, is flame proof, and has lower capital and maintenance costs than any other horizontal belt filter. (Sandoski-FIRL)
W76-08487

FIBER RECOVERY INCREASES WATER REUSE, REDUCES TREATMENT COST,
Dorr-Oliver, Inc., Stamford, Conn.
For primary bibliographic entry see Field 5D.
W76-08489

SLURRY-BURNING PROCESS.
For primary bibliographic entry see Field 5D.
W76-08498

ENVIRONMENTAL AND PUBLIC HEALTH CONSEQUENCES OF THE CONTROLLED DISPOSAL OF TRANSURANIC ELEMENTS TO THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5C.
W76-08604

REFUSE INTO POWER,
Louisville Univ., Ky. Dept. of civil Engineering.
For primary bibliographic entry see Field 5D.
W76-08693

RECYCLING--EXAMPLES FOR ITS POSSIBILITIES AND LIMITS (RECYCLING--BEISPIELE FUER MOEGLICHKEITEN UND GRENZEN),
For primary bibliographic entry see Field 5D.
W76-08701

CHEMICAL CLARIFICATION OF WASTE WATER.
For primary bibliographic entry see Field 5D.
W76-08702

THE EFFECTIVE MANAGEMENT OF WASTE.
For primary bibliographic entry see Field 5D.
W76-08704

THE ELECTROLYTIC PROCESSING OF CYANIDE WASTES,
For primary bibliographic entry see Field 5D.
W76-08706

INDUSTRIAL WASTE TREATMENT SYSTEM REDUCES POLLUTION,
Sherwood Medical Industries, Inc., Waterbury, Conn.
For primary bibliographic entry see Field 5D.
W76-08711

MUNICIPAL INDUSTRIAL WASTE PROGRAM NETS $8.9 MILLION IN TWO YEARS.
For primary bibliographic entry see Field 5D.
W76-08712

INDUSTRY TAKES THE LEAD IN CLEANING UP THE RHINE.
For primary bibliographic entry see Field 5D.
W76-08713

A MODIFIED RAW-WOOL SCOURING SYSTEM FOR EASIER EFFLUENT TREATMENT,
Commonwealth Scientific and Industrial Research Organization, Belmont (Australia). Div. of Textile Industry.
For primary bibliographic entry see Field 5D.
W76-08717

RE-USE AND DISPOSAL OF WASTE ACIDS,
Hoeschst A. G., Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5D.
W76-08721

WATER QUALITY EFFECTS OF A DREDGING DISPOSAL AREA,
Northwestern Univ., Evanston, Ill. Technological Inst.
For primary bibliographic entry see Field 5C.
W76-08749

5F. Water Treatment and Quality Alteration

WATER QUALITY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 5G.
W76-08155

ZERO ENERGY INPUT FLOCCULATOR,
W. L. Harris.
U.S. Patent No. 3,941,695, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 339, March 2, 1976.

Descriptors: *Patents, *Water treatment, Water quality control, *Water purification, Potable water, Mixing, Flocculation, Flow, Settling basins, Coagulation, *Flocculation.
Identifiers: *Flocculators.

The invention provides a flocculator which enables the formation of relatively large coagulant flocs while the need for any exterior power input to drive the flocculator is eliminated. A flocculator which is defined by a hub that is rotatable about an axis extending transversely to the water flow is placed in a sedimentation basin. A number of equally spaced trough-shaped paddles is mounted to the hub for rotation. The paddles are completely submerged and defined by relatively thin, undulated sheet members such as semi-circular sections of corrugated culvert pipe to enhance the strength and rigidity of the paddles and maximize the paddle surface. The surface maximization increases the ultimate floc size apparently because of the increase of the contacts between coagulant particles suspended in the raw water. The flocculator wheel rotates slowly with the water flow and thus causes only gentle water agitation which aids the formation of flocs without the danger of tearing apart already formed flocs. The trough-shaped configuration of the paddles and their transverse orientation to the water flow causes a rotation of the flocculator wheel by virtue of the water flow past it. (Sinha-OEIS)
W76-08200

STERILIZATION OF HOLDING TANKS AND TOILET BOWLS BY QUATERNARY COMPOUNDS,
Baylor Coll. of Medicine, Houston, Tex. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08201

MODULAR WATER FILTER,
Eaton Corp., Cleveland, Ohio. (Assignee).
R. N. Rogers, and M. O. Saar.
U.S. Patent No. 3,945,923, 6 p, 12 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1907, March 23, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Potable water, Water quality control, *Filtration, *Filters, Odor, Taste, Turbidity, Carbon filter.
Identifiers: Modular filters.

A modular filter assembly for cleaning and polishing potable waters includes a fabric turbidity removal module and an adsorptive taste and odor removal module. The modules are connected in series so as to have turbidity removal prior to taste and odor removal to extend the operating life of the taste and odor removal module. The turbidity removal module includes a porous, fabric material assembly which is of a rolled or wrapped construction which provides a large filtration area to prevent its clogging prior to the utilization of the adsorptive capabilities of the taste and odor removal module. The turbidity removal module includes a flow grid assembly having inner and outer flow grid to maximize the distribution of the fluid being filtered over the filtration area of the module and to assure lateral flow of the filtered fluid through the module. The modular construction enables the turbidity removal module to be utilized separately and renders the module self-cleaning when operated under certain flow conditions. The taste and odor removal module is provided with flow dispersion means which serves to reduce the flow velocity of the filtering fluid through the module to prevent channeling and maximize the adsorptive capacity of the adsorptive material contained in the module. (Sinha - OEIS)
W76-08210

THE WATER SUPPLY SYSTEM OF A LARGE URBAN AGGLOMERATION IN SWITZERLAND (DIE WASSERVERSOWGUNG EINER SCHWEIZERISCHEN GROSS-AGGLOMERATION),
M. Schalekamp.
Wasser- und Energiewirtschaft, Vol. 65, No. 6, p 211-225, June, 1973. 32 fig.

Descriptors: *Water supply, *Potable water, Groundwater resources, Spring waters, Surface waters, Construction, Pipelines, Water delivery, Water demand, Storage requirements.
Identifiers: Zurich(Switz), Lengg Lake.

The current and future water supply system of Zurich, Switzerland, and of its adjacent communities

has been determined. The increasing water consumption by industries and the population has led to a steadily decreasing percentage of drinking water obtainable from spring water and groundwater resources. Subsequently, the importance of surface water bodies as drinking water sources has been increased. Adequate water tariffs, closed water cycles in industrial processes, and the exclusive use of reflux coolers are among the basic methods of reducing water consumption. To meet future water needs, the water supply system will be enlarged in the next twenty years by the extension of the Lengg Lake waterworks, the construction of the necessary pipelines, the enlargement of the Zurich water supply system including the construction of groundwater waterworks at Hardhof and of emergency waterworks elsewhere, and by the construction of a new lake waterworks complete with pipelines and storage basins at Moos. (Nave-FIRL)
W76-08233

WATER TREATMENT UNTOUCHED BY HUMAN HANDS - ALMOST,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
E. H. Pitman.
The American City, Vol. 88, No. 9, p 92-94, September, 1973. 4 fig.

Descriptors: *Treatment facilities, *Water treatment, *Automation, Water distribution(Applied), Telemetry, Water softening, Filtration, Filters, Coals, Turbidity, Effluent, Reservoir storage, Pumps, Control systems, Monitoring, Computers, Florida.
Identifiers: Gainesville(Fla), Clarifiers, Lime-soda softening.

The new Gainesville, Florida, water plant will go on-line next year, and will be one of the most automated existing 40 mgd lime-soda softening operations. Telemetry will be used to monitor all plant functions, and a computer will control the water treatment processes. The computer also will tie into the present telemetry of the city water distribution system. Treatment will consist of lime-soda softening with two, 85-foot diameter Eimco solids contact reactor clarifiers. Two submersible-combustion Ozark-Mahoning recarbonators, using natural gas, will stabilize the clarified water. The plant will have four filters, each processing 10 mgd at a 5 gpm/sq ft filtration rate. The Turbatrol mixed media filters will use granular anthracite and sand over a Leopold filter underdrain bottom. Turbidity monitoring at the media interface and at the effluent outlet will be provided as will loss of head indicators for backwash control. Backwash will be started manually by the operator with automatic sequencing thereafter. Filtered water will be controlled in an 875,000-gallon capacity clear well for transfer to two 5-million-gallon capacity ground storage reservoirs. A 500,000-gallon capacity wash water tank will provide a nearly constant head during the backwash cycle using the plant's Peerless pumps. (Sandoski-FIRL)
W76-08266

WATER QUALITY CRITERIA FOR GREAT LAKES WATERS TO BE USED AS MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5D.
W76-08363

DEMAND BACTERICIDE FOR DISINFECTING WATER AND PROCESS OF PREPARATION,
Kansas State Univ. Research Foundation, Manhattan. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08391

WATER FILTER ASSEMBLY,
For primary bibliographic entry see Field 8C.
W76-08392

DRINKING WATER PURIFICATION IN INDUSTRIALLY MANUFACTURED COMPACT INSTALLATIONS OF THE TYPE 'STRUYA', (IN ENGLISH),
Academy of Municipal Economy, Moscow (USSR). Research Inst. of Public Water Supply, Water Purification.
V. M. Korabel'nikov, L. A. Sergunina, A. I. Itskova, S. I. Plitman, and D. I. Stolbov.
Gig Sanit. 3, p 33-38, 1975.

Descriptors: *Water treatment, *Potable water.
Identifiers: *Struya treatment installations, USSR.

Struya industrial installations are effective for small and rural local water supply systems. The simple, compact Struya installation decontaminates and disinfects drinking water.--Copyright 1976, Biological Abstracts, Inc.
W76-08579

5G. Water Quality Control

AN OPTIMIZATION MODEL FOR REGIONAL WATER QUALITY MANAGEMENT,
Lehigh Univ. Bethlehem, Pa. Dept. of Economics.
J. R. McNamara.
Water Resources Research, Vol. 12, No. 2, p 125-134, April 1976. 3 fig, 2 tab, 26 ref.

Descriptors: *Water quality, *Management, *Pollution abatement, *Optimization, *Hudson River, Waste treatment, Marginal costs, Flow, Regulation, Biochemical oxygen demand, Constraints, Decision making, Mathematical models, Equations, Systems analysis, *New York.
Identifiers: Nonlinear programming, Geometric programming, Cost minimization.

The use of combinations of pollution abatement techniques will become imperative in coming years as waste loads increase and the application of secondary level treatment at each point of discharge becomes inadequate to maintain the desired levels of water quality. At high levels of waste treatment, costs rise nonlinearly with the fraction of waste removed. The marginal cost of each of a series of pollution abatement techniques at a given location is likely to be less than the marginal cost of a single technique operated very intensively. Herein, a nonlinear programming model for water quality management is developed, capable of assessing the contributions of a variety of pollution abatement techniques and compatible with an efficient solution procedure. Formulated as a geometric programming problem, the model is intended to be a preliminary selection device permitting the planner to compare alternative configurations and to sketch a roughly optimal solution. It is shown that this formulation permits the simultaneous consideration of waste treatment processes, bypass piping, flow regulation, and artificial aeration in determining a least-cost solution to a given water quality management problem. The model is applied to the upper Hudson River of New York. (Bell-Cornell)
W76-08104

LAND USE AND WATER QUALITY IN NEW YORK RIVERS,
Cornell Univ., Ithaca, N. Y. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08133

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES, GENERAL REPORT, VOLUME I,
Wahler (W. A.) and Associates, Palo Alto, Calif.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-243 074, $7.75 in paper copy, $2.25 in microfiche. Bureau of Mines OFR 50(1)-75, December 1974. 202 p, 43 fig, 5 tab, 3 append. Bu Mines S0110520.

Descriptors: *Disposal, *Mine wastes, *Dam failure, Mills, Mining, Hydrology, Mining engineering, Geology, Waste disposal, Evaluation.
Identifiers: *Mill tailings, *Disposal practices, *Disposal systems and methods, Inundation, Seismicity, Stability analysis, Liquifaction, Phreatic surface.

The results of a study of mill tailings disposal practices and potential tailings dam stability problems were presented. The Bureau of Mines initiated this research effort as a first step in the development of technology and practices necessary to significantly improve refuse disposal safety. This volume, Volume I included a summary of conclusions and recommendations resulting from the overall research effort; discussions of disposal systems and methods, geology, seismicity, hydrology, and materials characteristics; evaluation of investigational techniques; discussions of usable interim generalized investigational, analytical and inspection procedures; discussion of general principles and presentation of a tailings technology manual outline; and discussion of needed future research and recommended programs. (Roberts - ISWS)
W76-08143

WHAT DOES A 'CLEAN' ENVIRONMENT COST,
Houston Univ., Tex.
R. G. Thompson, and R. J. Lievano.
Hydrocarbon Processing, Vol. 54, No. 10, p 73-77, 1975. 4 tab.

Descriptors: *Pollution abatement, *Standards, *Energy, *Costs, Prices, Fossil fuels, Demand, Supply, Water quality standards, Environment.
Identifiers: Price regulation.

Modeling results are cited to show how pollution abatement standards affect the demand and supply of fossil fuels and how the effects of price regulation relate to their production. 'Strict' industrial pollution abatement standards almost double the price of natural gas, primarily due to the incentive to substitute clean fuel for investment in abatement equipment. With price deregulation, 'lax' standards induce a sufficient level of oil and gas prices to stimulate a maximum supply response for fossil fuels. The model shows that 36% more gas is produced under deregulation than was produced under regulated prices, but only 3.7% more crude is produced in the lower 48 states in 1985 under deregulation. 'Lax' standards generate coal production by 94% at a 1985 market-clearing price of $14.04/ton; 'strict' standards would increase coal prices slightly. 'Strict' standards and higher energy prices reduce usage of natural gas, electricity, and gasoline in residential and transportation sectors. However, use of both oil and coal increases with 'strict' standards and higher energy prices because the relative rise in delivered price of oil is less than the increase in delivered prices of gas and electricity. 'Strict' standards increase water use by 288% and solid waste discharges 180-fold. (Auen-Wisconsin)
W76-08150

ENVIRONMENTAL QUALITY AND INFLATION: A REGIONAL PERSPECTIVE ON THE COST-PUSH IMPACT OF THE 1972 PURE WATER LEGISLATION,
Lyndon B. Johnson School of Public Affairs, Austin, Tex.
K. E. Haynes, and W. T. Kleeman.
Environment and Planning, Vol. 7, No. 5, p 567-574, 1975. 1 fig, 4 tab, 8 ref. NSF-RANN GI-34870X.

Descriptors: *Water pollution control, *Industries, *Waste water treatment, *Inflation(Economic), Legislation, Economic impact, Regional economics, Texas, Input-output analysis, Water quality standards.
Identifiers: Corpus Christi(Texas), PL 92-500, Effluent standards, Pure Water Act.

The inflationary effects of the 'Pure Water' Act (PL 92-500) requiring 'Best Available Treatment' of major industries' wastes by 1978 and zero waste discharges by 1983 were measured at the 13 county regional economy of Corpus Christi, Texas, by first assessing the consequences of unrestricted economic growth and no environmental controls and comparing growth rates under different environmental policy assumptions. The study was based on a preexisting input-output model and in addition to the usual application of such models for assessing impacts of exogenous influences on income and employment, the focus was on the relationship between pollution abatement and the effects of increasing prices on each sector and on the economy as a whole. The resulting new dollars values of total inputs were greater than those projected under unrestricted economic growth. For 1980, the only sector that had a total-output price increase of more than 1% was water and sanitary services, which went up by 9.93%. When all 71 industrial sectors were taken together the price increase averaged only 0.04%. Under the zero discharge policy prices again increased, but only modestly. Water and sanitary services showed a jump of 22.38% over the projected levels. However, for all 71 processing sectors together the increase averaged only 0.07%. (Auen-Wisconsin)
W76-08151

ECONOMIC CONCEPTS AND TECHNIQUES PERTAINING TO WATER SUPPLY, WATER ALLOCATION, AND WATER QUALITY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-08152

WATER QUALITY.
Institute for Water Resources (Army), Fort Belvoir, Va.
In: 'Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality', IWR Paper 75-P5, December 1975. Part Three. 120 p, 1 fig, 62 tab. DACW31-76-M-0435.

Descriptors: *Planning, *Water quality, *Water treatment, *Estimated costs, Water types, Pollutants, Water utilization, Technology, Reservoirs, Wells, Groundwater recharge, Design data, Intakes, Pipelines, Construction costs, Operating costs, Maintenance costs, Water storage, Pumping plants, Desalination plants, Sewage treatment, Outlets, Water reuse, Waste water treatment, Storm water, Interception sewers, Waste water disposal, Cooling towers, Cost allocation, Capital costs, Evaluation, Damages.
Identifiers: Water quality indices.

In order to assist planners in giving fuller recognition of water quality characteristics, quantifying them, and integrating them more meaningfully in their water supply plans and project designs, this section reviews surface water resources and their contaminants, water quality indices and standards, water user tolerances, water quality models, technology and costs of raw and waste water treatment, water quality benefits, and optimization of water supply purification, allocation, and waste water renovation. Cost estimating data is presented together with methods of estimating costs. A number of economic techniques are discussed for taking into account and quantifying water quality parameters, utilizing available water quality enhancement technology, determining the value of water quality, assessing damages attributable to the use of inferior water quality, blending and allocating water of varying quality, and maintaining instream water quality levels. A broad range of water quality problems are reviewed and examples given for the application of optimization techniques in arriving at alternative solutions. A number of useful approaches and methods for dealing with water demand situations in which water quality is an irrelevant or important factor are also presented. Topics are grouped under 'Water quality concepts,' 'Water quality enhancement technology and cost,' 'Water quality benefits,' 'Water quality optimization,' and 'Waste water renovation for reuse.' (See also W76-08152) (Auen-Wisconsin)
W76-08155

CONTROL OF ACID MINE DRAINAGE.
Institute for Water Resources (Army), Fort Belvoir, Va.
In: 'Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality, IWR Paper 75-P5, December 1975. Part Three, Sec IX. 8 p. DACW31-76-M-0435.

Descriptors: *Costs, *Pollution abatement, *Strip mines, *Acid mine water, Mine drainage, Ohio, Decision making, Land reclamation.

The problem considered is whether a small strip mine in southeastern Ohio can afford to control water pollution and restore the disturbed land. Analysis was based on the nature of the market, the firm's cost schedule as affected by water quality criteria and the least-cost technology. The conclusion is that at least one level of acid mine water treatment was feasible, but only with steeply rising revenues dependent on inelastic demand. When the cost of acid water control is added to the cost of land reclamation the cheapest of the four control methods priced and the least-cost of the three land reclamation techniques combined would add 11 cents to the cost of processing a ton of coal. The most expensive combination would add 41 cents per ton. (See also W76-08152) (Auen-Wisconsin)
W76-08156

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, TEXTILE INDUSTRY.
Lockwood Greene Engineers, Inc., Spartanburg, S. C.
Available from the National Technical Information Service, Springfield, Va., 22161, ad PB-244 802, $13.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/06, August 1975, 481 p. WQ5AC021.

Descriptors: *Industrial wastes, *Textiles, *Estimated costs, Effluents, Industrial water, Pretreatment(Water), Water quality standards, Federal Water Pollution Control Act, Regulation, Water pollution control, Capital costs, Operation and maintenance, *Waste water treatment, *Pollution abatement, Pulp wastes.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Textile industry, *Water pollution control technology.

Water pollution abatement technologies are examined for 11 subcategories of the textile industry (SIC 22) capable of meeting four levels of effluent limitations, including those promulgated by the U. S. Environmental Protection Agency under the Federal Water Pollution Control Act Amendments of 1972, i.e., BPTCA or best practicable control technology currently available for 1977 and BATEA or best available technology economically achievable for 1983. Total estimated costs for the industry to meet the 1977 level, expressed in 1973 dollars, was $384-780 million in capital expenditures depending upon land availability and cost and $49-68 million annually in operation and maintenance. Total estimated costs for the industry to meet the 1983 level, also in 1973 dollars, was an additional $526-785 million in capital expenditures and an additional $50-81 million annually in O and M. Pretreatment requirements for the industry as presently promulgated were found to offer little encouragement for a firm to use municipal treatment systems. (NCWQ)
W76-08186

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, CANNED AND PRESERVED FRUITS AND VEGETABLES,
Environmental Associates, Corvallis, Oreg.
A. F. Mauldin, and M. R. Soderquist.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 801, $21.25 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/05, June 1975, 828 p, 6 append. WQ5AC010.

Descriptors: *Canneries, Federal Water Pollution Control Act, *Costs, Regulation, *Pollution abatement, Technology, *Food processing industry, Water quality standards, *Industrial wastes, *Waste water treatment, *Estimated costs, Water pollution control, Operating costs, Capital costs, Maintenance costs, Performance.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Fruits, Vegetables, *Water pollution control technology.

Water pollution abatement technologies are examined for approximately 20 subcategories of the fruits and vegetables industry (SIC 2032, 2033, 2034, 2035, and 2037) capable of meeting six levels of effluent limitations, two of them corresponding to levels promulgated by the U. S. Environmental Protection Agency under Federal Water Pollution Control Act Amendments of 1972, i.e. BPCTA or best practicable control technology currently available for 1977 and BATEA or best available technology economically achievable for 1983. A strategy incorporating both inplant modifications and end-of-pipe treatment systems was utilized involving a number of portions for each level. Costs were developed in 1973 dollars for capital, operation and maintenance and requirements considered for non-financial resources. Performance is stated in terms of resulting effluents. Approximately 1,000 treatment plant cost estimates are presented. (NCWQ)
W76-08187

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE ORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 544, $21.25 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/03, June 1975, (800) p. WQ4AC015.

Descriptors: *Chemical industry, Federal Water Pollution Control Act, Technology, *Industrial wastes, *Chemical wastes, Organic wastes, *Costs, Waste disposal, *Pollution abatement, Capital costs, Operating costs, *Water pollution control, Maintenance costs, Performance, Effluents, *Waste water treatment, Treatment facilities.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Miscellaneous chemicals industry, *Organic chemicals industry.

Technologies are examined which are currently available or anticipated for the organic chemicals industry (SIC 2865 and 2869) and the miscellaneous chemicals industry (SIC 2831, 2833, 2834, 2861, 2879, 2891, 2892 and 2899) to meet water pollution abatement requirements of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). Levels of pollution abatement which are reviewed include those promulgated by U. S. Environmental Protection Agency for 1977 (BPCTCA or best practicable control technology currently available) and for 1983 (BATEA or best available technology economically achievable). Capital, operating and maintenance costs are given in 1973 dollars. Performance is stated in terms of resulting effluents. (NCWQ)
W76-08188

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE INORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 800, $13.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/04, June 1975, 503 p. WQ4AC015.

Descriptors: *Chemical industry, Federal Water Pollution Control Act, Technology, *Industrial wastes, Chemical wastes, *Inorganic compounds, *Costs, Waste disposal, *Pollution abatement, Capital costs, Operating costs, *Water pollution control, Maintenance costs, Performance, Effluents, *Waste water treatment, Treatment facilities.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Inorganic chemicals industry.

Technologies are examined which are currently available or anticipated for the inorganic chemicals industry (SIC 2812, 2813, 2816 and 2819) to meet water pollution abatement requirements of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). Levels of pollution abatement which are reviewed include those promulgated by U. S. Environmental Protection Agency for 1977 (BPCTCA or best practicable control technology currently available) and for 1983 (BATEA or best available technology economically achievable). Capital, operating and maintenance costs are given in 1973 dollars. Performance is stated in terms of resulting effluents. (NCWQ)
W76-08189

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES PETROLEUM REFINING INDUSTRY, PART 1, CHAPTERS -V.
Engineering-Science, Inc., Austin, Tex.
Available from the National Technical Information Services, Springfield, Va., 22161, as PB-243 830, $16.25 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/02, Pt. I, June 1975, 303 p. WQ5AC004.

Descriptors: *Industrial wastes, Federal Water Pollution Control Act, Regulation, Industrial water, Organic compounds, Technology, *Pollution abatement, Water quality standards, *Water pollution control, Operating costs, Capital costs, *Costs, Maintenance costs, Oil wastes, Oil pollution, *Waste water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Petroleum refining industry, Water pollution abatement, Water pollution control technology.

Chapter headings are: Executive Summary; Inventory of Petroleum Refining Industry; Subcategorization Methodology; Levels of abatement Performance; and Technology Capabilities of Refinery Wastewater Abatement Systems. Technologies are examined which are available or anticipated for the petroleum refining industry (SIC 2911) to achieve water pollution abatement as required by the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). Six levels of pollution abatement are reviewed including EOD (elimination of the discharge of pollutants) and levels promulgated by the U. S. Environmental Protection Agency for 1977 (BPCTCA or best practicable control technology currently available) and for 1983 (BATEA or best available technology economically achievable). Capital, operating and maintenance costs are given in 1973 dollars along with requirements for non-financial resources. Performance is stated in terms of resulting effluents. (See also W76-08191) (NCWQ)
W76-08190

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, PETROLEUM REFINING INDUSTRY, PART 2, CHAPTERS VI - IX.
Engineering-Science, Inc., Austin, Tex.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-243 830, $16.25 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/02 - pt 2, June 1975, 364 p, 6 append. WQ5AC004

Descriptors: *Industrial wastes, Federal Water Pollution Control Act, Regulation, Industrial water, Organic compounds, Technology, *Pollution abatement, Water quality standards, *Water pollution control, Operating costs, Capital costs, *Costs, Maintenance costs, Oil wastes, Oil pollution, *Waste water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Petroleum refining industry, Water pollution abatement, Water pollution control technology.

Chapter headings are: costs, labor and material for water pollution abatement; industry-wide cost, labor and material requirements; new refineries and expansions; and effect of other variables on refinery waste treatment. Technologies are examined which are available or anticipated for the petroleum refining industry (SIC 2911) to achieve water pollution abatement as required by the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). Six levels of pollution abatement are reviewed including EOD (elimination of the discharge of pollutants) and levels promulgated by the U. S. Environmental Protection Agency for 1977 (BPCTCA or best practicable control technology currently available) and for 1983 (BATEA or best available technology economically achievable). Capital, operating and maintenance costs are given in 1973 dollars along with requirements for non-financial resources. Performance is stated in terms of resulting effluents. (See also W76-08190) (NCWQ)
W76-08191

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, PLANNING.
Wise (Harold F.) and Associates, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 907, $8.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/10, August 1975, 228 p, 6 append. WQ5AC030

Descriptors: Land development, Federal Water Pollution Control Act, Institutions, Land use, Permits, Treatment facilities, Regulation, *Planning, Water quality standards, Pollution abatement, River basin development, *Administration, Construction costs, Waste treatment, *Institutional constraints, Water pollution control, Administrative agencies.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Land use planning, *National Pollutant Discharge Elimination System, Water pollution abatement.

The planning sections of the Federal Water Pollution Control Act Amendments of 1972 (Secs. 106, 208, 209, and 303) are examined along with their administration by the U. S. Environmental Protection Agency and the states. Planning is not yet fulfilling its role of ordering and integrating the key parts of the law, the National Pollutant Discharge Elimination System and the municipal facilities construction program. An important reason is the constraint of time and the need for the Federal and state agencies to implement these programs quickly. The most significant planning provision of the law, Sec. 208, which calls for area planning, is as yet virtually untried, but difficulties of administration are foreseen. One is the jealousy of local governments of their authority over land use. (NCWQ)
W76-08192

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, THE PERMIT PROGRAM.
Energy and Environmental Analysis, Inc., Arlington, Va.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 805, $11.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/09, August 1975, 388 p, 12 fig, 65 tab, append. WQ5AC041

Descriptors: Effluents, Federal Water Pollution Control Act, *Permits, Regulation, Industrial wastes, Institutions, *Administrative agencies, Sewage treatment, Federal-State water rights conflicts, *Administration, Waste disposal, Water quality standards, Treatment facilities, Waste treatment, Water pollution control, Pollution abatement, Institutional constraints.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *National Pollutant Discharge Elimination System, Water pollution abatement.

The permit program (the National Pollutant Discharge Elimination System) established by Section 402 of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) is examined. Its administration is described as successful in achieving compliance by industry but a failure as applied to municipal dischargers; permits to municipalities so far issued, can be described as 'licenses to pollute.' Eighty percent of industrial dischargers surveyed indicated that they would install 'best practicable control technology' and additionally required technology by July 1, 1977, but industry will contest upcoming 1983 standards for best available treatment, toxic standards and pre-treatment standards. Federal-State relations in administering the program were strained and awkward at the beginning but are now improving. (NCWQ)
W76-08193

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, CONSTRUCTION GRANTS.
Touche, Ross and Co., Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 804, $10.50 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/08, August 1975, 342 p. WQ5AC046

Descriptors: *Construction costs, Pollution abatement, Institutions, Planning, Financing, *Treatment facilities, Waste water treatment, Surveys, Grants, Federal Water Pollution Control Act, Pollution abatement, Waste treatment, Operation and maintenance, Specifications, Water pollution control, Water quality standards.
Identifiers: *Construction Grants, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement.

The Construction Grants program established by the Federal Water Pollution Control Act of 1972 (PL 92-500) is examined. Five operational functions are identified and analyzed -- the needs survey/priority list, facility planning, (Step 1), plants and specifications (Step 2), construction (Step 3), and operation and maintenance. The management functions of program guidance, organization, capital funding and management systems are also reviewed. The existing procedures at the federal, state and local levels are overly complex and must be simplified through a comprehensive management system. The program will not achieve the water pollution control objectives of the law (relating to publicly owned treatment works) within the established time frames, although significant progress is being made toward the objectives. (NCWQ)

W76-08194

AN ANALYSIS OF U. S. ENVIRONMENTAL PROTECTION AGENCY'S NEEDS SURVEY,
American Public Works Association, Chicago, Ill.
R. H. Sullivan, and M. B. Cohn.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-244 803, $10.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ-75/07, August 1975, 324 p, 100 tab, 2 append. WQ4AC014

Descriptors: Combined sewers, Federal Water Pollution Control Act, Surveys, Grants, *Treatment facilities, *Municipal wastes, Financing, Sewage treatment, *Estimated costs, *Construction costs, Sewers, Pollution abatement, *Waste water treatment, Sludge disposal, Storm sewers, Waste disposal, Water pollution, Water quality.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Water pollution control technology.

Representatives of states and major municipalities were asked how they based their construction cost estimates for publicly owned wastewater treatment works which they submitted for the U. S. Environmental Protection Agency's 1974 needs survey, as required by Section 516 of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500). Sources of overstated costs included high population estimates, lack of cost effectiveness analysis, and the assumption that sewer separation is the principal solution to combined sewer overflow problems. Possible reasons for understated costs were missing entries and omission of sludge disposal costs. Areas of uncertainty included incomplete sewer system evaluation, availability of stormwater control technology, and accuracy of assumptions concerning required effluent quality. Additional information was obtained on funding, unreported needs and construction progress. (NCWQ)
W76-08195

CLEANING OF CARGO COMPARTMENTS,
D. Gutnick, and E. Rosenberg.
U.S. Patent No. 3,941,692, 6 p, 3 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 338, March 2, 1976.

Descriptors: *Patents, Water pollution, *Water pollution control, *Water quality control, *Oil pollution, Oil wastes, Storage tanks, Oily water, Cleaning, Microbial degradation, Biological treatment, Safety, Pollution abatement.
Identifiers: Ballast water.

The invention provides an economical and safe process of carrying out the cleaning of the cargo tank compartments and the use of water ballast, in one operation, and at the same time, of converting the waste petroleum oil in the cargo tank compartment into useful and valuable protein products. The residual oil in the cargo tanks, after they have been emptied, can be converted whooly or in part to non-oily products by means of microbial action, so that the subsequent cleaning of the cargo compartment can be carried out with a minimum effort and without the buildup of dangerous electrostatic charges. Sea water is added to the cargo compartment tank, after it has been emptied of its oil. The sea water is added primarily as a vehicle for the microbial fermentation process and no attempt is made at this point to wash the compartment. Nitrogen and phosphorus are added as well as small amounts of other carbohydrate sources such as glucose, starch and the like. The mixture of residual oil, nutrients and water is then used without sterilization. A suitable microbial inoculum is then added and the fermentation carried out under aerated conditions. (Sinha - OEIS)
W76-08198

COANDA EFFECT OIL-WATER SEPARATOR,
Office of the Secretary (Navy). Washington, D. C.
A. J. Paszyc, D. Pal, and J. B. Curry.
U.S. Patent No. 3,945,920, 3 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1906, March 23, 1976.

Descriptors: *Patents, *Water pollution treatment, *Water purification, *Water quality control, *Water treatment, *Separation techniques, Oil pollution, Oily water, Centrifugation, Bubbles.
Identifiers: Coanda effect.

An oil-water separating device utilizes the wall attachment effect for separating oil from an oil-water mixture in a continuous manner. The device is comprised of an oil-water mixture inlet nozzle delivering the mixture into a bounded region inside the separator to form a mixture jet which attaches to one wall creating a separation bubble in the bounded region. The bounded region is provided by a cavity formed by two or more plates joined together with an oil collecting chamber provided on top of the bounded region by an additional plate. The oil is captured in the bounded region by the separation bubble and flows into the oil collecting chamber through connecting holes. The oil in the collecting chamber is transferred by an oil outlet, either by siphoning or by means of a metering pump to an oil storage tank. The water, being heavier, tends to flow away from the separation bubble created by the centrifugal force field. The substantially oil-free water can be pumped back into the sea or can be pumped back to the input for recycling if desired. A multiple stage oil-water separator can be provided by forming a plurality of series-connected, bounded regions between the two plates. (Sinha - OEIS)
W76-08209

INNOVATIVE TECHNOLOGIES FOR WATER POLLUTION (ABATEMENT).
Water Purification Associates, Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 390, $13.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ-75/13, December 1975, 524 p, append. (In association with Process Research, Inc., Cambridge, Mass.). WQ5ACO89.

Descriptors: *Pollution abatement, *Technology, Federal Water Pollution Control Act, Water pollution control, *Permits, *Land management, Costs, Industrial wastes, Membrane processes, Separation techniques, Sewage treatment, Waste disposal, Adsorption, *Waste water treatment, Sludge disposal, Combined sewers.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Elimination of discharge(Wastes).

The 1985 goal of the Federal Water Pollution Control Act of 1972 (P.L. 92-500) calls for the elimination of discharge (EOD) of pollutants. Innovative technologies capable of achieving or approaching EOD are examined and include land treatment, membrane separation, adsorption, thermal separation, chemical oxidation, and suspended matter removal. Various options are examined for ultimate disposal of the pollutants removed from the wastewaters. The study indicates that innovative technologies can achieve or closely approach EOD for municipal and all major industrial sources. Costs generally fall in the range of $1 to $5 per 1000 gallons (1973 dollars) but higher costs may be experienced for some technologies in certain applications. Lower costs generally apply for land treatment systems where conveyance is not excessive. Land treatment alone does not achieve EOD but must be supplemented with other technologies to achieve salt removal. Research and development over the next decade should be directed to membrane separation, adsorption, land treatment and residuals disposal. (NCWQ)
W76-08220

THE WATER POLLUTION CONTROL ACT OF 1972 INSTITUTIONAL ASSESSMENT, ATTITUDES OF PARTICIPANTS.
Oregon Research Inst., Eugene.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-247 392, $10.00 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ-75/15, December 1975, 212 p, 6 append. WQ5AC067

Descriptors: *Attitudes, Social aspects, Public rights, *Permits, *Regulation, Federal Water Pollution Control Act, Social values, *Institutional constraints, *Social change, Social impact, Administrative agencies, Legal aspects, *Social participation.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Three groups of persons are surveyed who are 'participants' in the implementation of the Federal Water Pollution Control Act: Federal and State officials; industries, municipalities and consulting engineers; and environmentalists. Substantial support for the Act was found, ranging (as measured by the expression of favorable attitudes) from 94 percent of U.S. Environmental Protection Agency employees to 53 percent of industrialists. Major problems and areas of basic disagreement were found, among them were the chances of achieving the Act's goals by the dates called for; the wisdom of the goals themselves, particularly the 1985 goal of the elimination of the discharge of pollutants; and rigid v. flexible procedures of enforcement. (NCWQ)
W76-08221

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, URBAN RUNOFF.
Black, Crow and Eidsness, Ind., Atlanta, Ga.; and Jordan, Jones and Goulding, Inc. Atlanta, Ga.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-247 391, $10.75 in paper copy, $2.25 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ-75/14, December 1975, 380 p, 29 fig, 110 tab, 129 ref. WQ5AC083.

Descriptors: *Cost analysis, Water quality control, Drainage, *Urban runoff, Rainfall, *Storm water, Cities, Runoff, Pollution abatement, Soil erosion, Mathematical models, *Storm sewers, Urban hydrology, Surface waters, Waste water treatment, Waste treatment, Water pollution control.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

This study shows that urban stormwater runoff contributes significantly to the annual pollutant loads of the Nation's waters in urban areas. Suspended solids and oxygen demand characteristics of urban runoff appear to be the most significant contributions to pollution when compared with other publicly owned sources. The composition of urban stormwater runoff was found to vary widely in pollutant constituents for many poorly defined reasons. The treatment technology best suited to the abatement of urban stormwater pollution remains to be developed. Abatement of urban stormwater pollution to a level equivalent to secondary treatment would represent a commitment of approximately 150 to 170 billion dollars. (NCWQ)
W76-08222

USE OF CRUSHED LIMESTONE TO NEUTRALIZE ACID WASTES,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
F. H. Pearson, and A. J. McDonnell.
Journal of the Environmental Engineering Division, Proceedings of the Society of Civil Engineers, Vol. 101, No. EE1, Proceedings paper No.

11131, p 139-158, February 1975. 11 fig, 35 equ, 10 ref. OWRT A-030-PA(5).

Descriptors: *Acids, Treatment, Environmental engineering, Wastes, *Limestones, Mathematical models, Optimization, Equations, *Kinetics, Design, Neutralization, Water quality, *Waste water treatment.
Identifiers: Reactors.

To provide for the rational design of limestone neutralization processes, the kinetics of the chemical reactions involved were evaluated by experiment, and an analysis was made of the chemical and physical boundary conditions that control the extent to which the reactions are completed. The rate limiting reactions are the attack of limestone by hydrogen ions, and the exsolution of carbon dioxide which is thereby generated; the latter reaction has an increasing effect on process efficiency above pH 5. Rate constants for the limiting reactions were evaluated each as a function of temperature, ionic strength, water turbulence, and for the first reaction bicarbonate ion concentration, which catalyzes the attack of limestone by hydrogen ions. A mathematical model of limestone neutralization processes was simplified to obtain a graphical procedure for the process design for neutralization. These graphs indicate the quantity of crushed limestone of given size that is required to neutralize a specified flow of acid waste from the initial pH to the required final pH. (Bell-Cornell)
W76-08225

LAND-USE MODEL FOR SERVICE AREA PROJECTION,
Brookhaven National Lab., Upton, New York, Dept. of Applied Science.
P. M. Meier.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol, 102, No. EE1, p 71-85, February 1976. 8 fig, 14 equ, 18 ref. OWRT-B-011-MASS(15).

Descriptors: *Environmental engineering, *Land use, *Management, *Sewers, *Water supply, *Waste water(Pollution), Planning, Population, Sewage, Simulation analysis, Mathematical models, Systems analysis, Equations, Forecasting.

A new method for projecting future sewer service areas is developed, based on a model of land use and intra-urban migration behavior. The derivation of a partial differential equation describing residential population density profiles through time is based on an analogy to the recharge well in an unconfined aquifer, and an adaptation of Darcy's Law. A numerical solution of this equation, coupled with an evaluation of the changes in residential density at the service area periphery, is the basis for generating successive future sewer service areas. Because the model forces the user into an investigation of land-use changes, it is suggested that the method provides a more rational basis for the specification of design year flows for interceptors and sewage treatment facilities than do the traditional subjective expedients. (Bell-Cornell)
W76-08226

DEVELOPMENT OF STORM DRAINAGE COST FUNCTIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3D.
W76-08227

DRAINAGE RUNOFF OF THE GROUNDWATER UNSTEADY FLOW TO THE DRAINS (DRENAZNY ODTOK PRI NEUSTALENOM PRUDENI PODZEMNEJ VODY K DRENOM),
For primary bibliographic entry see Field 4B.
W76-08239

LAKE MICHIGAN GETS HELP,
Milwaukee Sewerage Commission, Wis.
For primary bibliographic entry see Field 5D.
W76-08246

PUMPS FREE CITY FROM LAKE ERIE FLOODING.
For primary bibliographic entry see Field 8C.
W76-08250

WATER TREATMENT UNTOUCHED BY HUMAN HANDS - ALMOST,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5F.
W76-08266

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III - VOLUME 1--DRY WEATHER FLOWS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-08278

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS - PHASE III, VOLUME 4 - PROJECT SUMMARY,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-08281

THE RELATIONSHIP BETWEEN WATERSHED USE AND STREAM WATER QUALITY,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 4D.
W76-08282

CHANGING HOG HAIR FROM COSTLY NUISANCE TO ASSET.
Penn Packing Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W76-08297

ECONOMICS OF IN-PLANT WASTE MANAGEMENT IN FOOD PROCESSING,
Economic Research Service, Washington, D. C. Natural Resource Economics Div.
For primary bibliographic entry see Field 3E.
W76-08300

UPDATING THE NAVY ENVIRONMENTAL PROTECTION DATA BASE TO INCORPORATE OIL SPILL CLEAN-UP PERFORMANCE,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5B.
W76-08320

GUIDELINES FOR MATERIAL PLACEMENT IN MARSH CREATION,
Center for Environment and Man, Inc., Hartford, Conn.
L. E. Johnson, and W. V. McGuinness, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A010 725, $7.50 in paper copy, $2.25 in microfiche. Contract Report D-75-2, April 1975. 225 p, 28 fig, 29 tab, 85 ref, 5 append. ARMY DACW39-74-C-0094.

Descriptors: *Marshes, *Dredging, *Spoil banks, Environment, Environmental control, Coasts, Tidal waters, Estuaries, Rivers, Vegetation, Habitat improvement, Marsh management, Wildlife habitats, Disposal, Landfills.
Identifiers: *Marsh creation, Dredged materials, Guidelines.

This report presents a systematic set of guidelines for creating new marshes from dredged material under a variety of situations and constraints. New marshes were characterized on the basis of the frequency of dredging, confinement requirements, and the need for surcharging. Pertinent information on important physical environmental factors, dredging and disposal operational practices, and engineering properties of dredged materials was used to develop guidelines for creating each type of marsh. (Sims-ISWS)
W76-08325

SELF-PURIFICATION CAPACITY OF IMPOUNDMENTS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Laborator.
For primary bibliographic entry see Field 5C.
W76-08358

WATER QUALITY CRITERIA FOR GREAT LAKES WATERS TO BE USED AS MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5D.
W76-08363

OPTIMAL POLLUTION CONTROL AND TRADE IN COLLECTIVE GOODS,
State Univ. of New York, Stony Brook. Dept. of Economics.
E. James.
Journal of Public Economics, Vol. 3, No. 3, p. 203-216, 1974. 1 fig., 25 ref.

Descriptors: *Pollution abatement, *Pollution taxes(Charges), Federal government, Management, Efficiencies, Theoretical analysis, Regions, Local governments, Water pollution control.

The concept of pollution abatement by either local or national control through the imposition of a pollution tax is examined. A series of models is presented, starting with a simple no-trade, no spillover case and becoming progressively more complex. Where trade in pollution is not possible and there are no spillovers, the optimal pollution tax will vary by community and local control is probably superior to national control. Where pollution is optional, excludable and can be parcelled out among communities, trade in pollution may be possible. If multiple communities are involved in such trade, either local or national control, can, theoretically, lead to optimal control. Thus rather than being a substitute for a uniform tax, trade constitutes a necessary condition for a uniform tax to be effective. However, imposition of a single national pollution tax is not a sufficient mechanism to keep communities in optimal trade equilibrium. When communities have different attitudes toward pollution, they may gain from exchanging products with divergent pollution intensities, even if their tastes and factor endowments are otherwise identical. Trade in outputs is an imperfect substitute for trade in pollution input, and cannot equalize the marginal disutility of pollution and optimal tax rate across communities. (Auen-Wisconsin)
W76-08367

THE CHERRY CREEK-CASSELMAN RIVER ENVIRONMENTAL IMPROVEMENT PLAN,
Maryland Dept. of Natural Resources, Annapolis.
L. G. Hecht.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 767, $4.50 in paper copy, $2.25 in microfiche. Prepared for the Appalachian Regional Commission. Final Report, January 1974. 57 p, 4 tab, append (separate report), 4 map, 15 ref. ARC 72-47/RP-228.

Descriptors: Water management(Applied), *Water pollution control, Abatement, *Acid mine water, *Water quality, *Planning, *Environmental impacts, *Mine drainage, *Solid wastes, Environment, Land use, Flood control, Transportation, Maryland, Pennsylvania, *Watershed management.
Identifiers: Cherry Creek(Md), Casselman Creek(Md and Pa).

Cherry Creek Watershed (14 square miles) is entirely within Garret County, MD. Casselman River Watershed lies north of Cherry Creek Watershed and extends into PA. Land use is 18% cropland, 12% pasture, 67% woodland, and 3% other uses (mines, communities, industrial developments). Agriculture is the major industry. Some planning efforts have been undertaken: a study of Upper Casselman Watershed for water supply, flood control, and recreation; the National Freeway Study; land planning by the Department of Natural Resources; and planning by Garrett County to establish zoning regulations. Problems include: inadequate water supply, flooding on both streams, insufficient water based recreation facilities, and unclear land use planning policies. Environmental problems which are discussed include: mine drainage pollution (which has been dealt with in a separate detailed report), solid waste problems, including abandoned cars and open dumps, municipal and industrial water quality problems, and air quality problems caused by stationary sources. The final chapter ranks each of these problems according to several criteria: extent of degradation, cost of abatement, visibility of problems, and relationship to other public improvement programs. The study area is divided into six sub-regions. Cherry Creek, which is polluted only by mine drainage, is given highest priority. The North Branch Casselman River is given second priority and is polluted by mine drainage and 2 solid waste sites. Poor environmental conditions have been seen as a barrier to development of water supply and recreation, as well as a barrier to economic development. (Smith-North Carolina)
W76-08384

PREPARATION OF PLANS AND SPECIFICATIONS FOR POLLUTION ABATEMENT ACTIVITIES IN CHERRY CREEK WATERSHED, MARYLAND.
Skelly and Loy, Harrisburg, Pa.; and Zollman Associates, Inc., Baltimore, Md.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 578, $7.50 in paper copy, $2.25 in microfiche. Prepared for the Appalachian Regional Commission, Washington, D. C., July 1973. Final Report. 189 p, 4 append. ARC 73-35/RPC767.

Descriptors: Water pollution, *Water pollution control, Abatement, *Acid mine water, *Mine acids, *Coal mine wastes, *Specifications, Vegetation regrowth, Water management(Applied), Acquatic animals, *Maryland, Watershed management, Landfill, Pollution abatement.
Identifiers: *Cherry Creek watershed(Md).

This document contains detailed plans and specifications to carry out an abatement program in the Cherry Creek Watershed (MD) which has been heavily polluted by acid from mine drainage and natural sources. It is expected that abatement will improve water quality to the extent that a trout population can be re-established. More than 95% of the 28% acid load which is caused by the mining areas is expected to be eliminated by abatement. Eight pollution sources are to be treated, but it is emphasized that results will not be immediate in all cases because vegetative cover will take some time to form. In addition it is necessary to control pollution from ongoing mining operations. Specific abatement projects include regrading of strip mining sites along with establishment of suitable vegetation, surface water diversion by ditches above some mines, and deep mine sealing. Daylighting, which involves stripping out the deep mine workings, was considered but is too expensive. An estimated $298,000 is needed to accomplish the work which is to be done. Reduction in acid load will be about 723 lbs/day, or $412 per pound. Future action to ensure effectiveness of the reclamation is needed, including periodic monitoring of sealed deep mines, maintenance and inspection of regraded strip mines, limitation of livestock grazing and land use until vegetation is well established, prohibition on strip mining of sealed mines, and strict enforcement of laws. (Smith-North Carolina)
W76-08385

MINE DRAINAGE POLLUTION WATERSHED SURVEY, CHERRY CREEK, CASSELMAN RIVER WATERSHEDS, GARRETT COUNTY, MARYLAND.
Skelly and Loy, Harrisburg, Pa.
For primary bibliographic entry see Field 5B.
W76-08386

DEVELOPMENT OF AN OVERALL ECONOMIC/ENVIRONMENTAL PLAN FOR THE MONONGAHELA RIVER BASIN.
Gibbs and Hill, Inc., New York.
For primary bibliographic entry see Field 5C.
W76-08387

FLOATING OIL BARRIER,
Offshore Devices, Inc., Lynn, Mass. (Assignee).
J. H. Milgram.
U. S. Patent No. 3,943,720, 3 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1112, March 16, 1976.

Descriptors: *Patents, *Water quality control, *Water pollution control, Water pollution treatment, *Oil pollution, Oil spills, Oily water, Barriers, Obstruction to flow, *Separation techniques, *Pollution abatement.

An oil barrier for use in the open sea to contain oil on the surface is comprised of a flexible barrier provided with a number of flotation means only on the outside of the barrier, thereby avoiding churning of the oil and water on the inside of the barrier into an oil-water mixture that could pass under the barrier in rough sea conditions. The flotation means is composed of inflatable members packaged on the outside surface of the barrier, with a counter weight associated with the flotation means placed at the end of the flotation means opposite the barrier when it is inflated. The result is that the center of gravity of the assembly is in the desired position in relation to the center of buoyancy. (Sinha-OEIS)
W76-08396

APPARATUS FOR PUMPING OIL-WATER MIXTURE FROM A COLLECTION VESSEL OF A FLOATING OIL COLLECTOR INTO SETTLING TANKS,
A. Y. Derzhavets, P. G. Kogan, and V. I. Tabachnikov.
U.S. Patent No. 3,944,489, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 944, No 3, p 1363, March 16, 1976.

Descriptors: *Patents, *Water quality control, *Water pollution control, Water pollution treatment, *Oil pollution, *Separation techniques, Settling basins, Flow, Equipment, *Pumps.
Identifiers: Oil-water mixture.

Apparatus for pumping oil-water mixture from the collection vessel of a floating oil collector into settling tanks is composed of at least one oil receiving means for collecting oil-water mixture, arranged below the level of the liquid in the collection vessel and connected through a conduit to the upper part of one of the settling tanks. Besides, the apparatus includes means providing for vertical displacement of the oil receiving means and a pump for pumping water from the lower part of one of the settling tanks outboard of the floating oil collector and an aspirating air-water jet ejector for maintaining substantially permanent vacuum in each settling tank. The ejector has the air line connected to the upper part of each settling tank and the jet is connected to the delivery side of the pump. The lower part of one of the settling tanks is connected to the upper part of that settling tank from the lower part of which this pump draws water. The liquid column established in the conduit connecting the oil receiving means with the upper part of the settling tank is higher than the liquid column established in the other conduit. (Sinha - OEIS)
W76-08403

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W76-08411

THE TOXICITY OF VARIOUS MINING FLOTATION REAGENTS TO RAINBOW TROUT (SALMO GAIRDNERI),
Sir George Williams Univ., Montreal (Quebec). Dept. of Biological Sciences; and Sir George Williams Univ., Montreal (Quebec). Water Pollution Research Lab.
For primary bibliographic entry see Field 5C.
W76-08448

WATER RESOURCES OF THE WORLD, SELECTED STATISTICS.
Geraghty and Miller, inc., Port Washington, N.Y.
For primary bibliographic entry see Field 7C.
W76-08507

NITRATE REDUCTION AND ASSOCIATED MICROBIAL POPULATIONS IN A PONDED HANFORD SANDY LOAM,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
M. G. Volz, L. W. Belser, M. S. Ardakani, and A. D. McLaren.
Journal of Environmental Quality, Vol. 4, No. 1, p 99-102, January-March 1975. 1 fig, 3 tab, 21 ref.

Descriptors: *Nitrates, *Denitrification, Soils, Soil investigations, *Soil bacteria, Nitrites, Water quality control, Loam.
Identifiers: *Nitrate reduction, Microbial ecology.

A field plot of Hanford sandy loam was ponded for 2 weeks with a solution of KNO3 and CA(NO3)2 containing 100 ppm NO3-N in order to measure short term denitrification rates as well as growth and distribution of bacteria capable of reducing nitrate to nitrite and/or N20 and N2. Denitrifying bacteria generally decreased in number with depth and time and were not as numerous as nitrate reducers. (Skoberboe-Colorado State)
W76-08546

TRANSFER OF BORON AND TRITIATED WATER THROUGH SANDSTONE,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-08547

WATER QUALITY IN THE MAD RIVER BASIN, HUMBOLDT AND TRINITY COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-08562

PHYTOPLANKTON IN NORTHERN DONETSK PONDS FOR ADDITIONAL TREATMENT, (IN UKRANIAN),
Dnepropetrovskii Gosudarstvennyi Universitet (USSR). Inst. of Hydrobiology; and Dnepropetrovskii Gosudarstvennyi Universitet (USSR).
For primary bibliographic entry see Field 5C.
W76-08577

EVALUATION OF MINERALIZATION PROCESSES FOR SRP WASTES,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
G. H. Thompson.
Available from the National Technical Information Service, Springfield, Va 22161, as DP-1389, $3.50 in paper copy, $2.25 in microfiche. 16 p, 4 tab, 3 fig, 12 ref. ERDA AT (07-2)(1).

Descriptors: *Radioactive wastes, *Cesium, *Sludge, Separation techniques, *South Carolina, Ziolites, Waste treatment.
Identifiers: Savannah River Plant(SC), Mineralization processes.

Radioactive wastes from the SRP consist of an insoluble sludge containing most of the actinides and fission products except cesium and a supernate which contains most of the cesium. Means of separating the sludge and the cesium from a relatively nonradioactive residue were investigated. Mineralization or a possible method of solidification were investigated. Cesium could be removed from the waste supernate and fixed in zeolite. By reacting alkaline cesium-containing waste with kaolinite, sodalite and cancrinite can be prepared with volume increases up to 285 times that of the zeolite product and leachabilties at least 10000 times that of the zeolite product. Reaction of cesium with bentonite and kaolinite produced a power, pollucite but net all of the cesium reacted. Cesium leachabilities or product volumes of the minerals was not affected by gamma doses of 10 to the 10th power. Simulated sludge was solidified by reaction with sodium hydroxide and silica gel. (Chilton-ORNL)
W76-08595

NATURAL AND AGRICULTURAL ECOSYSTEMS,
Tasmanian Coll. of Advanced Education, Launceston.
For primary bibliographic entry see Field 6G.
W76-08667

CALCULATED DRAINAGE WATER COMPOSITIONS AND SALT BURDENS RESULTING FROM IRRIGATION WITH RIVER WATERS IN THE WESTERN UNITED STATES,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 5B.
W76-08671

WATER QUALITY IN IRRIGATED WATERSHEDS,
California Univ., Riverside. Dept. of Soil Science Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-08679

TRANSIENT WATER QUALITY MODELING IN STREAMS,
Cornell Univ. Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-08730

NUMERICAL PREDICTION OF THERMAL-REGIME OF RIVERS,
Nalco Environmental Sciences, Northbrook, Ill. Physical Science Div.
For primary bibliographic entry see Field 5B.
W76-08739

FAST CURRENT OIL CONTROL STUDY,
Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
W. P. Graebel, and V. A. Phelps.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-009 040, $7.50 in paper copy, $2.25 in microfiche. Report No. CG-D-84-75, August 1974. 195 p, 10 fig, 4 tab, 10 ref, 6 append. DOT-CG-32430-A.

Descriptors: *Model studies, *Oil spills, *Oil pollution, Hydraulic models, Water pollution, Currents(Water), Water pollution control, Pollution abatement, Oil, Oil wastes, Oily water, Oil-water interfaces, *Barriers, Instrumentation, Equipment.
Identifiers: *Oil recovery, Oil recovery devices, Oil herding devices.

Model studies of oil containment barriers and herding devices were conducted in an open channel of six foot width and three and one-half foot depth. Currents up to four feet per second were used with three different oils. Incipient failure of the barriers occurred for values of the densimetric Froude number of about unity. Trajectories of the oil drops at incipient failure were given. Oil herding devices were tested at various angles to the current. This performance in regard to loss rates was superior to that of the barriers, and improved as the angle between current and herder was decreased. Multiple barriers and barriers with nets were also tested. No substantial improvement was found over that for a single barrier. A vortex oil recovery device was conceived and tested, which showed only very small loss rates at all speeds tested. Its rate of recovery of a slick increased with current speed. (Sims-ISWS)
W76-08748

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

AN OPTIMIZATION MODEL FOR REGIONAL WATER QUALITY MANAGEMENT,
Lehigh Univ. Bethlehem, Pa. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-08104

ECONOMIC CONCEPTS AND TECHNIQUES PERTAINING TO WATER SUPPLY, WATER ALLOCATION, AND WATER QUALITY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-08152

WATER ALLOCATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-08154

CONTROL OF ACID MINE DRAINAGE.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 5G.
W76-08156

MODELS OF ACTUAL COMMUNITIES,
For primary bibliographic entry see Field 8I.
W76-08219

TRANSIENT WATER QUALITY MODELING IN STREAMS,
Cornell Univ. Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-08730

6B. Evaluation Process

IDENTIFICATION, MEASUREMENT, AND INCORPORATION OF ENVIRONMENTAL QUALITY OBJECTIVES IN NATURAL RESOURCE DEVELOPMENT,
Iowa State Univ., Ames. Dept. of Economics.
H. D. Schellenberg.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 250, $9.25 in paper copy, $2.25 in microfiche. PhD thesis, 1973. 296 p. 7 fig., 21 tab., 92 ref., 5 append. OWRT B-037-IA (1).

Descriptors: *Social aspects, *Environment, *Psychological aspects, *Evaluation, *Resources development, Methodology, Estimating, Multiple-purpose reservoirs, Model studies, Cost-benefit analysis, Project planning, Surveys, Environmental effects, *Iowa.
Identifiers: *Environmental quality, Pareto efficiency, Ames Reservoir(Iowa), Skunk River(Iowa), Trade-offs.

The problem of identifying and measuring the effect of proposed reservoirs upon environmental quality was approached by inquiring into the nature of amenity services flowing from natural resources at reservoir sites. Procedures for incorporating amenity possibilities were developed by use of the maximum GNP and broad productivity criteria (not dependent upon the measurement of utility, but equity considerations could be noted.) A public survey was designed which ranked the contribution of seven resource categories to amenity values and to provide estimates of the magnitude of amenity benefits arising from preservation so that benefits and costs of the proposed Ames Reservoir on the Skunk River, Iowa, could be made. Some parameters of the evaluation were: Estimation of net monetary benefits from reservoir construction, determination of the physical magnitude of reservoirs upon natural resources which might provide amenity services; determination of the relative importance in providing amenity services, which when combined with the physical magnitude of the reservoir's contribution to amenity provided an aggregate index of alternatives; identification of trade-off curves from reservoir net benefits to represent economic development, and an aggregate index measure of environmental quality; monetary measurement of amenity services by willingness-to-pay was applied to an alternative plan, and Pareto-betterment was identified if a trade-off or production-possibility curve was identified. (Auen-Wisconsin)
W76-08101

EFFICIENT RESOURCE UTILIZATION WITHIN A REGIONAL FRAMEWORK.
Iowa State Univ., Ames. Dept. of Economics.
B. A. AbuKishk.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 194, $9.25 in paper copy, $2.25 in microfiche. PhD thesis, 1973. 250 p. 26 fig., 54 tab., 108 ref., 2 append. OWRT B-042-IA (1).

Descriptors: *River basin development, *Resources development, *Environmental effects, *Flood control, *Erosion control, Soil conservation, *Iowa, Agriculture, Cost sharing, Industries, Water utilization, Employment, Linear programming, Model studies, Indirect costs, Planning, Human population, Labor supply, Sediment yield, Damages, Cost-benefit analysis, Indirect benefits, Drainage systems, Crops, Livestock, Appreciation, Value, Optimization.

Identifiers: *Skunk River Basin(Iowa), Demography, Nutrient losses.

The Skunk River Basin, Iowa, was the prototype for information of interrelationships between improving resource use, employment opportunity, and environmental quality, with emphasis on soil conservation practices and reduction in flood damage. The study evaluated the optimal mix of activities at quinquennial time periods, 1970-1985, in the agricultural and industrial sectors subject to environmental constraints, the impact of particular land use policies with respect to financing soil conservation, to what extent erosion control can modify the need for large dam construction, developed a linear programming model, and arrived at recommendations subject to specified limitations. The findings indicate that optimal resource allocation can be obtained at an erosion level within the range 1-5 tons/acre; financing soil conservation at a low interest rate allows achievement of the highest possible net income at a lower erosion level; there is a limited substitutability between erosion level and public cost; the possibility for expansion in the manufacturing sector is very good; but expansion of this sector may increase the waste quantities discharged into the Skunk River; the optimal solution suggests that soil erosion must be limited on class three land by either terracing or cover crops. The model can be extended for interregional planning. (Auen-Wisconsin)
W76-08102

ECONOMIC CONCEPTS AND TECHNIQUES PERTAINING TO WATER SUPPLY, WATER ALLOCATION, AND WATER QUALITY,
Institute for Water Resources (Army), Fort Belvoir, Va.
E. D. Bovet.
IWR Paper 75-P5, December 1975. 302 p, 17 fig. DACW31-76-M-0435.

Descriptors: *Planning, *Economic efficiency, *Water supply, Groundwater, Costs, Optimization, *Water allocation(Policy), Inter-basin transfers, Water treatment, Reservoir operation, Cost allocation, Pollution abatement, *Water quality, Acid mine water, Water reuse, Water demand, Damages, Desalination, Industrial water, Sewerage, Water quality standards, Thermal pollution, Water yield, Water shortage.

A condensation of several Army Engineer Institute for Water Resources studies provides guidelines to the water resource planner. The three part format is divided into nine sections specifically relevant to planning for surface water supply by estimating water demand and sizing water supply, planning for ground water supply and mixed water use. Water supply costs, the risk of water supply shortages and industry's response to changing water costs are evaluated. Interregional planning for water resources allocation is based on studies conducted in Utah and deals with allocation in an urbanizing agricultural region, a statewide water resource allocation model, inter-basin water transfers for agriculture, and demand for agricultural water. Planning for water quality deals with water quality concepts, water quality enhancement technology and costs, water quality benefits, and water quality optimization. Consideration is given for the rationale for wastewater reuse as a potable supply, safety of reused wastewater, economic efficiency, acceptability, and the results of a mathematical model present cost comparisons. The economic feasibility of acid mine drainage control and land reclamation are discussed as they relate to a small strip mine. (See W76-08152 thru W76-08156) (Auen-Wisconsin)
W76-08152

WATER SUPPLY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 4A.
W76-08153

WATER ALLOCATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
In: 'Economic Concepts and Techniques Pertaining to Water Supply, Water Allocation, and Water Quality' IWR Paper 75-P5, December 1975, Part Two. 89 p, 12 fig. DACW31-76-M-0435.

Descriptors: *Optimization, *Planning, *Water allocation(Policy), *Economic efficiency, Decision making, Mathematical models, Systems analysis, Utah, Interbasin transfers, Costs, Water demand, Watersheds(Basins), Industrial water, Municipal water, Irrigation water.
Identifiers: Interregional planning.

The details of an optimal solution, integrating various aspects of a statewide water allocation problem, is presented as a tool for interregional water resource planning. The solution to the problem involves the determination of cost schedules and supply functions for water in various uses. By means of a linear programming model, the economically efficient water allocation can be computed for present and projected demographic conditions. The inclusion of demand and supply analyses as separate components of the model avoids the problems involved in least-cost planning for projected demands. In the Utah study, the marginal, or least productivity activity turned out to be the agricultural use, which is highly sensitive to rising costs. Multiple demands can be usefully included in a mathematical model, so that efficient allocations among uses can be determined directly. Costs of policies deviating from efficient allocations can be determined using supply functions, demand functions, or both. From these costs, public decision makers can readily analyze results of alternative decisions. Hydrologic modeling also can be effectively included in a mathematical programming allocation model. Once the model is constructed, changes in structure or coefficients can be carried out at little cost relative to their usefulness in planning. (See also W76-08152) (Auen-Wisconsin)
W76-08154

WATER QUALITY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 5G.
W76-08155

CONTROL OF ACID MINE DRAINAGE.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 5G.
W76-08156

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, PLANNING.
Wise (Harold F.) and Associates, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08192

THE WATER POLLUTION CONTROL ACT OF 1972 INSTITUTIONAL ASSESSMENT, ATTITUDES OF PARTICIPANTS.
Oregon Research Inst., Eugene.
For primary bibliographic entry see Field 5G.
W76-08221

REASSESSMENT OF THE CROSS-FLORIDA BARGE CANAL: A PROBABILITY APPROACH,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 4A.
W76-08228

ATTITUDES AND PUBLIC PARTICIPATION ON THE HIGH PLAINS TOWARD GROUNDWATER PLANNING AND MANAGEMENT INSTITUTIONS,
Texas Tech Univ., Lubbock. Dept. of Political Science.
F. L. Baird, and R. E. Smith.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 519, $4.50 in paper copy, $2.25 in microfiche. Completion Report, May, 1976. 64 p, 29 tab. OWRT A-027-TEX(1) 14-31-0001-5044 14-34-0001-6045.

Descriptors: Irrigation, Distribution, *Groundwater, *Attitudes, *Groundwater movement, Planning, *Water management(Applied), *Texas, *Great Plains, *Institutional constraints, Regulation.
Identifiers: Farmer opinions, Federal subsidies, Federal or state regulation.

In those counties in Texas where irrigation is still developing and confidence in the future supply of adequate groundwater is high, there will be strong opposition to any form of public groundwater management and planning. With irrigation relatively well developed and the recognition through education and/or experience that groundwater is not unlimited, the county's farmers will be more inclined to join an Underground Water Conservation District (UWCD), as it most closely conforms to their basic philosophy. This process may speed up if there is an influx of farmers from depleted areas determined not to repeat past mistakes. On the other hand, the process may be impeded due to such factors as uneven distribution of groundwater, historical antagonisms, leadership struggles, and the like. Nevertheless, in general, farmer opinion appears to be most united behind UWCD's while an area is enjoying its peak period of irrigation and in the stages of decline. By the time groundwater depletion becomes severe and farmers feel they are in a crisis situation, the cohesiveness of their opinions backing UWCD's gradually dissipates. Irrigation farmers faced with loss of groundwater seek remedies in direct federal subsidies; others advocate federal or state regulation financed by the general taxpayers' money; a substantial but a diminished portion remain loyal to the UWCD, but advocate more vigorous use or increase of its powers; and others turn against all public management so they can gain complete freedom in using what groundwater they have left.
W76-08375

THE HALTON-WENTWORTH WATERFRONT STUDY, VOLUME 1, CONCEPTS FOR WATERFRONT DEVELOPMENT (SUMMARY).
Acres Consulting Services Ltd., Niagara Falls (Ontario).
June 1974. 27 p, 5 plates, 1 map.

Descriptors: *Land use, *Planning, *Open space, Economics, *Lake Ontario, *Lake shores, *Water quality, *Shore protection, Erosion, Area redevelopment, Recreation, Fish, Streams, Air pollution, Parks, Transportation, *Canada.
Identifiers: Halton(Ontario), Hamilton-Wentworth(Ontario), *Waterfront development, Public participation, Stream valley protection, Hamilton Harbour(Hamilton-Wentworth(Ontario).

Recommendations are summarized from a larger report which was intended to provide guidelines for future development, and was largely developed out of a ten month public participation program. Some objectives for this waterfront area are: maintain the existing land use pattern while increasing the amount of well distributed open space; increase the amount of public shoreline from the present 20% to 40%, and eventually secure access to the entire shore; provide more open space and recreation opportunities on land and water; protect unique features of the area; improve water and air quality; preserve stream valleys as an important resource; preserve fish and wildlife; establish planning and design controls for

residential and commercial development on the shore; allow for transportation; and preserve and improve industrial and port areas as essential components of the economic base of the region. The two adjacent planning areas, the Regional Municipality of Halton and the Regional Municipality of Hamilton-Wentworth, come together on the shores of Lake Ontario in the Province of Ontario. There are 13 areas of concern along the 60 miles of shore. An estimated cost of $223.7 million includes construction, land acquisition, development and some relocation of facilities. A recommended cost sharing is given which indicates that the Province would bear the heaviest burden, $79 million, reflecting that policy and overall planning is necessary at that level for much of the development. (Smith-North Carolina)
W76-08382

PRESENT AND FUTURE MULTIPLE USE DEMANDS ON THE PINYON-JUNIPER TYPE,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-08430

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT, AND DEVELOPMENT OF WATER RESOURCES,
Ecosystems International, Inc., Gambrills, Md.
H. L. Loats, T. R. Fowler, and S. Frech.
Available from the National Technical Information Service, Springfield, Va. 22161, as N75 18669, $5.50 in paper copy, $2.25 in microfiche. Quarterly Progress Report 74-C-3-1, October 30, 1974. 118 p, 5 fig, 6 tab, 12 append. NASA NAS 5-20567.

Descriptors: *Data collections, *Hydrologic data, *Computer models, *Remote sensing, *Satellites(Artificial), Monitoring, Telemetry, Water resources, Model studies, Computers, Federal government, State governments, Water management(Applied), Water resources development.
Identifiers: *Water resources users.

A survey of the principal water resource users was conducted to determine the impact of new remote data streams on hydrologic computer models. The analysis of the responses and direct contact demonstrated that: (1) the majority of water resource effort of the type suitable to remote sensing inputs is conducted by eleven major federal water resources agencies or through federally stimulated research, (2) the federal government develops most of the hydrologic models used in this effort, and (3) federal computer power is extensive. The computers, computer power, and hydrologic models in current use were determined. The effort in the remainder of the contract will be directed toward analyzing the effect of feasibility and timing of introduction of new data streams by contrasting the current trends of water resource users, both with and without remote sensing data. (Morris - ISWS)
W76-08536

UTILIZATION OF ERTS-1 DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 4A.
W76-08538

A FRAMEWORK FOR EVALUATING INSTITUTIONAL AND SOCIO-ECONOMIC ISSUES OF LAND TREATMENT OF WASTE WATER,
Economic Research Service, Upper Darby, Pa.
For primary bibliographic entry see Field 5D.
W76-08681

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 1-5 MGD PLANTS, PLANTS FOR HIGH PRODUCT RECOVERY,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08118

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS BRACKISH WATER DESALTING PLANTS, DESIGN OF 3-25 MGD LOW PRESSURE PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08119

WHAT DOES A 'CLEAN' ENVIRONMENT COST,
Houston Univ., Tex.
For primary bibliographic entry see Field 5G.
W76-08150

WATER SUPPLY.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 4A.
W76-08153

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, TEXTILE INDUSTRY.
Lockwood Greene Engineers, Inc., Spartanburg, S. C.
For primary bibliographic entry see Field 5G.
W76-08186

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, CANNED AND PRESERVED FRUITS AND VEGETABLES,
Environmental Associates, Corvallis, Oreg.
For primary bibliographic entry see Field 5G.
W76-08187

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE ORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08188

CAPABILITIES AND COSTS OF TECHNOLOGY FOR THE INORGANIC CHEMICALS INDUSTRY TO ACHIEVE THE EFFLUENT LIMITATIONS OF P. L. 92-500.
Catalytic Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-08189

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES PETROLEUM REFINING INDUSTRY, PART 1, CHAPTERS -V.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08190

WATER POLLUTION ABATEMENT TECHNOLOGY: COSTS AND CAPABILITIES, PETROLEUM REFINING INDUSTRY, PART 2, CHAPTERS VI - IX.
Engineering-Science, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08191

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, CONSTRUCTION GRANTS.
Touche, Ross and Co., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08194

AN ANALYSIS OF U. S. ENVIRONMENTAL PROTECTION AGENCY'S NEEDS SURVEY,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-08195

DEVELOPMENT OF STORM DRAINAGE COST FUNCTIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3D.
W76-08227

ECONOMICAL FOAM CONTROL IN WASTEWATER TREATMENT SYSTEMS,
Nalco Chemical Co., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W76-08249

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS SEA WATER DESALTING PLANTS, DESIGN OF 1-10 MGD SEAWATER PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08284

ALTERNATIVES FOR REDUCING WATER POLLUTION IN CATTLEHIDE PROCESSING AND TANNING,
Economic Research Service, Washington, D. C. National Economic Analysis Div.
For primary bibliographic entry see Field 3E.
W76-08285

NEW APPROACHES POINT TO BETTER ECONOMIES IN HIDE PROCESSING,
For primary bibliographic entry see Field 3E.
W76-08288

OPTIMAL POLLUTION CONTROL AND TRADE IN COLLECTIVE GOODS,
State Univ. of New York, Stony Brook. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-08367

DEVELOPMENT OF AN OVERALL ECONOMIC/ENVIRONMENTAL PLAN FOR THE MONONGAHELA RIVER BASIN.
Gibbs and Hill, Inc., New York.
For primary bibliographic entry see Field 5C.
W76-08387

ECONOMIC EVALUATION OF PROPOSED WATER CONSERVATION PRACTICES ON ESTABLISHED IRRIGATION DISTRICTS: A GENERAL METHODOLOGY AND APPLICATION TO THREE DISTRICTS IN OREGON,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 3F.
W76-08431

SOIL LOSS FROM ILLINOIS FARMS - ECONOMIC ANALYSIS OF PRODUCTIVITY LOSS AND SEDIMENTATION DAMAGE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4D.
W76-08533

DESALTING HANDBOOK FOR PLANNERS.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 3A.
W76-08584

RESOURCE RECOVERY: POSSIBILITIES AND PITFALLS,
International City Management Association, Washington, D.C. Management Development Center.
For primary bibliographic entry see Field 5D.
W76-08692

REFUSE INTO POWER,
Louisville Univ., Ky. Dept. of civil Engineering.
For primary bibliographic entry see Field 5D.
W76-08693

FLUORIDE REMOVAL: TECHNOLOGY AND COST ESTIMATES,
For primary bibliographic entry see Field 5D.
W76-08703

MUNICIPAL INDUSTRIAL WASTE PROGRAM NETS $8.9 MILLION IN TWO YEARS.
For primary bibliographic entry see Field 5D.
W76-08712

6D. Water Demand

RESIDENTIAL WATER CONSERVATION,
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 3D.
W76-08103

THE WATER SUPPLY SYSTEM OF A LARGE URBAN AGGLOMERATION IN SWITZERLAND (DIE WASSERVERSOWGUNG EINER SCHWEIZERISCHEN GROSS-AGGLOMERATION),
For primary bibliographic entry see Field 5F.
W76-08233

WATER RESOURCES OF THE WORLD, SELECTED STATISTICS.
Geraghty and Miller, inc., Port Washington, N.Y.
For primary bibliographic entry see Field 7C.
W76-08507

6E. Water Law and Institutions

ENVIRONMENTAL QUALITY AND INFLATION: A REGIONAL PERSPECTIVE ON THE COST-PUSH IMPACT OF THE 1972 PURE WATER LEGISLATION,
Lyndon B. Johnson School of Public Affairs, Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-08151

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, PLANNING.
Wise (Harold F.) and Associates, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08192

THE WATER POLLUTION CONTROL ACT OF 1972 INSTITUTIONAL ASSESSMENT, ATTITUDES OF PARTICIPANTS.
Oregon Research Inst., Eugene.
For primary bibliographic entry see Field 5G.
W76-08221

OPTIMAL POLLUTION CONTROL AND TRADE IN COLLECTIVE GOODS,
State Univ. of New York, Stony Brook. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-08367

ECONOMIC EVALUATION OF PROPOSED WATER CONSERVATION PRACTICES ON ESTABLISHED IRRIGATION DISTRICTS: A GENERAL METHODOLOGY AND APPLICATION TO THREE DISTRICTS IN OREGON,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 3F.
W76-08431

A FRAMEWORK FOR EVALUATING INSTITUTIONAL AND SOCIO-ECONOMIC ISSUES OF LAND TREATMENT OF WASTE WATER,
Economic Research Service, Upper Darby, Pa.
For primary bibliographic entry see Field 5D.
W76-08681

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, UNIT 2, SAN BENITO, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08376

FLOOD PLAIN INFORMATION: ALAMO AND ULATIS CREEKS, VACAVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08377

FLOOD PLAIN INFORMATION: EEL RIVER--STAFFORD TO HOLMES, HUMBOLDT COUNTY, CALIFORNIA,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08378

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, PACHECO CREEK, SAN BENITO COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08379

FLOOD PLAIN INFORMATION: SAN ANTONIO CREEK AND TRIBUTARIES, VICINITY OF OJAI, VENTURA COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08380

FLOOD PLAIN INFORMATION: PURGATOIRE RIVER AND TRIBUTARIES, VICINITY OF TRINIDAD, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-08381

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER AND TRIBUTARIES, GREAT BEND, KANSAS, TO JOHN MARTIN DAM, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-08388

FLOOD PLAIN INFORMATION: SALINE RIVER AND TRIBUTARIES, BENTON, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W76-08389

FLOOD PLAIN INFORMATION: COLORADO RIVER AND RIFLE, GOVERNMENT, HUBBARD GULCH CREEKS, RIFLE, COLORADO.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08390

6G. Ecologic Impact Of Water Development

IDENTIFICATION, MEASUREMENT, AND INCORPORATION OF ENVIRONMENTAL QUALITY OBJECTIVES IN NATURAL RESOURCE DEVELOPMENT,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-08101

EFFICIENT RESOURCE UTILIZATION WITHIN A REGIONAL FRAMEWORK.
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-08102

WHAT DOES A 'CLEAN' ENVIRONMENT COST,
Houston Univ., Tex.
For primary bibliographic entry see Field 5G.
W76-08150

THE HALTON-WENTWORTH WATERFRONT STUDY, VOLUME 1, CONCEPTS FOR WATERFRONT DEVELOPMENT (SUMMARY).
Acres Consulting Services Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 6B.
W76-08382

THE CHERRY CREEK-CASSELMAN RIVER ENVIRONMENTAL IMPROVEMENT PLAN,
Maryland Dept. of Natural Resources, Annapolis.
For primary bibliographic entry see Field 5G.
W76-08384

PREPARATION OF PLANS AND SPECIFICATIONS FOR POLLUTION ABATEMENT ACTIVITIES IN CHERRY CREEK WATERSHED, MARYLAND.
Skelly and Loy, Harrisburg, Pa.; and Zollman Associates, Inc., Baltimore, Md.
For primary bibliographic entry see Field 5G.
W76-08385

MINE DRAINAGE POLLUTION WATERSHED SURVEY, CHERRY CREEK, CASSELMAN RIVER WATERSHEDS, GARRETT COUNTY, MARYLAND.
Skelly and Loy, Harrisburg, Pa.
For primary bibliographic entry see Field 5B.
W76-08386

DEVELOPMENT OF AN OVERALL ECONOMIC/ENVIRONMENTAL PLAN FOR THE MONONGAHELA RIVER BASIN.
Gibbs and Hill, Inc., New York.
For primary bibliographic entry see Field 5C.
W76-08387

ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W76-08510

CHEMISTRY AND EFFECTS OF CHLORINE IN AQUATIC SYSTEMS, A SELECTED, ANNOTATED BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn. Ecological Sciences Information Center.
For primary bibliographic entry see Field 5C.
W76-08592

TRANSURANIUM NUCLIDES IN THE ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-08597

NATURAL AND AGRICULTURAL ECOSYSTEMS,
Tasmanian Coll. of Advanced Education, Launceston.
D. F. Smith, and D. M. Hill.
Journal of Environmental Quality, Vol. 4, No. 2, p 143-145, April-June 1975. 1 fig.

Descriptors: *Ecosystems, Agriculture, Management.
Identifiers: *Managed ecosystems, *Biological diversity.

It is argued that the task of creating awareness of environmental problems will require more than the bringing together of papers from a range of disciplines. It will depend on new consciousness and channels of communication. As an example of problems with terms, this paper analyses the use of natural and agricultural ecosystems, suggesting that on all valid criteria these form a continuum, rather than two discrete systems. (Skogerboe-Colorado State)
W76-08667

7. RESOURCES DATA

7A. Network Design

THE ESTIMATION OF LOCAL RAINFALL BY SAMPLE GAUGING,
For primary bibliographic entry see Field 2B.
W76-08348

EASTERN LAKE ONTARIO PRECIPITATION NETWORK,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2B.
W76-08412

THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W76-08537

INTERSTATION CORRELATION OF PEAK-FLOW ESTIMATES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-08555

DESIGN OF GROUND-WATER LEVEL OBSERVATION NETWORK.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-08563

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 2B.
W76-08694

7B. Data Acquisition

THE STUDY OF FRESH-WATER LAKE ICE USING MULTIPLEXED IMAGING RADAR,
Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
For primary bibliographic entry see Field 2C.
W76-08138

LAKE HURON SURFACE WATER TEMPERATURE, MAY-NOVEMBER, 1966,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Lab.
For primary bibliographic entry see Field 2H.
W76-08141

THE THEORY AND APPLICATIONS OF OCEAN WAVE MEASURING SYSTEMS AT AND BELOW THE SEA SURFACE, ON THE LAND, FROM AIRCRAFT, AND FROM SPACECRAFT,
City Univ. of New York. Inst. of Oceanography.
W. J. Pierson.
NASA Contractor Report 2646, January 1976. 388 p, 65 fig, 15 tab, 257 ref. NASA NAS 5-20041.

Descriptors: *Remote sensing, *Ocean waves, *Waves(Water), Instrumentation, Measurement, Equipment, Photography, Aerial photography, Aircraft, Satellites(Artificial), Ships, Oceans, Radar, Oceanography.

Nearly all of the known methods for measuring and analyzing ocean waves are described, including those presently in use on spacecraft and planned for SEASAT-A. Potential difficulties with synthetic aperture systems for a spacecraft were described and an alternate design is suggested. The different methods can yield different kinds of spectra and other kinds of imagery. Ways to compare different kinds of data were given. The scientific and practical applications of data from spacecraft were given. (Sims - ISWS)
W76-08145

EVALUATION OF ERTS DATA FOR CERTAIN HYDROLOGICAL USES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 7C.
W76-08147

EVALUATION OF METHODS FOR PRESERVING THE LEVELS OF SOLUBLE INORGANIC PHOSPHORUS AND NITROGEN IN UNFILTERED WATER SAMPLES,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
For primary bibliographic entry see Field 5A.
W76-08157

METHOD OF STUDYING THE SPATIAL DISTRIBUTION OF ORGANISMS, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science; and Moscow State Univ. (USSR). Dept. of Invertebrate Zoology.
Y. E. Romanovskii, and A. V. Smurov.
Zh Obshch Biol. 36(2), p 227-236, 1975.

Descriptors: *Spatial distribution, Methodology, Aquatic animals, Distribution patterns, Plankton, Model studies, Algorithms.
Identifiers: Calanus-Glacialis, Carabidae, Elateridae, Metridia-Longa, Staphylinidae, *Aggregation indices(Organisms).

A method is proposed which allows the application of theoretical statistical distributions as well as aggregation indices to sample data. The method is based on the relationship between theoretical distributions and ideal aggregation indices. The abstract character of ideal indices is overcome by the introduction of a new index KA equal to the ratio of the area free from aggregation to the total area under study. On the basis of the relationship between the index KA and the I index of Morisita the ecological significance of the latter is determined. Aggregation dynamics in populations is discussed by means of the following statistics: m*; the mean density of organisms in aggregations; m*, the mean density of organisms in the area under study; and KA = 1 - m(-)/m*; the new aggregation index. An algorithm of the spatial distribution of organisms is proposed, exemplified by plankton microdistribution, soil mesofauna and model distributions. (Metridia longa, Calanus glacialis, Carabidae, Elateridae and Staphylinidae are used as examples.)--Copyright 1976, Biological Abstracts, Inc.
W76-08176

IRRIGATION SIGNALLING DEVICE,
For primary bibliographic entry see Field 3F.
W76-08196

METHOD FOR LOCATING AND EVALUATING GEOTHERMAL SOURCES OF ENERGY BY SENSING ELECTROSTATIC VOLTAGE GRADIENTS,
For primary bibliographic entry see Field 4B.
W76-08204

MEASURING WATERSHED LAND-USE CHANGES WITH AIRPHOTOS,
Clemson Univ., S. C. Dept. of Civil Engineering.
D. B. Stafford, J. T. Ligon, and M. E. Nettles.
Transportation Engineering Journal, Proceedings of the American Society of Civil Engineers, Vol. 102, No. TE1, p 117-129, February, 1976. 4 fig, 2 tab, 5 ref. OWRT A-024-SC(6)

Descriptors: Water resources, *Watersheds(Basins), Hydrology, *Land use, *South Carolina, *Photogrammetry, *Aerial photography, Agriculture, Drainage, Floods, Mapping, *Remote sensing, Flow, Runoff, *Urbanization.

Aerial photographs were used to determine land use changes over a 25-year period in two watersheds in western South Carolina. The North Tyger River watershed near Spartanburg, South Carolina experienced changes in agricultural land use and the Reedy River watershed exhibited a conversion of rural land use to urban land use because of the urbanization occurring in the Greenville, S. C. urban area over the study period. Aerial photographs taken at approximately 5-year intervals were used to classify and measure the areas of various land-use classes in the two watersheds. The individual land-use parcels were measured by using a planimeter on aerial photographic enlargements. Significant changes in land use were observed in the two watersheds, changes that would be expected to have an important effect on the hydrologic response of the watersheds. The results obtained from the study indicate that the use of aerial photographs represents a satisfactory approach. (Bell-Cornell)
W76-08229

ABOUT THE PROBLEM OF DIRECT RUNOFF DETERMINATION BY SEPARATION OF THE HYDROGRAPH COMPONENTS (K OTAZKE URCENIA PRIMAEHO ODTOKU SEPARACIOU PRIETOKOVYCH VLN),
For primary bibliographic entry see Field 2A.
W76-08238

ULTRASONIC RIVER FLOW MEASUREMENT,
Atomic Energy Research Establishment, Harwell (England).
W. R. Loosemore.
Ultrasonics, Vol. 11, No. 5, p 195-196, September 1973. 2 fig.

Descriptors: *Instrumentation, *Flow rates, *Ultrasonics, Rivers, Water levels, Computers, Measurement, Automation, Equipment.
Identifiers: Flowmeters.

An ultrasonic flowmeter which will directly measure total flow rates in rivers has been developed by the Water Resources Board and the Atomic Energy Research Establishment in Harwell, England. The equipment offers no obstruction to the river flow and operate automatically and continuously. Measurements are made at pre-selected intervals, usually every 15 minutes, and the result is displayed locally in numerical form and then transferred to eight-hole punched paper tape in computer-compatible form. Water level is also measured as part of the sequence by a resistance level gage and again displayed in numerical form; readings are not affected by the condition of the year. The data is then automatically combined with the ultrasonically-determined velocity to computevolumetric flow rate. (Sandoski-FIRL)
W76-08241

NEW METHODS FOR ECOLOGICAL ANALYSIS OF MICROORGANISMS OF EUTROPHIC WATERS, (IN SPANISH),
Institute National de Limnologia, Santo Tome (Argentina).
For primary bibliographic entry see Field 5A.
W76-08252

ALTERNATIVE METHODS OF ESTIMATING SNOW WATER PARAMETERS,
Idaho Univ., Kimberly. Water Resources Research Inst.
For primary bibliographic entry see Field 2C.
W76-08259

THE RELATIONSHIP BETWEEN WATERSHED USE AND STREAM WATER QUALITY,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 4D.
W76-08282

ERTS-1 INVESTIGATION OF WETLANDS ECOLOGY,
American Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W76-08319

UPDATING THE NAVY ENVIRONMENTAL PROTECTION DATA BASE TO INCORPORATE OIL SPILL CLEAN-UP PERFORMANCE,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5B.
W76-08320

EVALUATION OF GLACIER MASS BALANCE BY OBSERVING VARIATIONS IN TRANSIENT SNOWLINE POSITIONS,
Norwegian Water Resources and Electricity Board, Oslo.
For primary bibliographic entry see Field 2C.
W76-08322

LASER APPLICATIONS TO ATMOSPHERIC SCIENCES - A BIBLIOGRAPHY,
Old Dominion Univ., Norfolk, Va.
For primary bibliographic entry see Field 10C.
W76-08323

INVESTIGATION OF USE OF SPACE DATA IN WATERSHED HYDROLOGY,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 4A.
W76-08326

ESTIMATING WATER SALINITY WITH GEOPHYSICAL EARTH RESISTIVITY EQUIPMENT,
Agricultural Research Service, Sidney, Mon.
For primary bibliographic entry see Field 2K.
W76-08332

A SIMPLE CONTINUOUS-FLOW RESPIROMETER FOR COMPARATIVE RESPIRATORY CHANGES IN MEDIUM-SIZED AQUATIC ORGANISMS,
Texas Christian Univ., Fort Worth. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08353

RAIN GAUGE,
For primary bibliographic entry see Field 2B.
W76-08397

MEASUREMENTS OF CURRENT FLOW DURING SUMMER IN LAKE HURON,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2H.
W76-08413

A COMPARISON OF MANUALLY DIGITIZED RADAR DATA AND OBSERVED COOL SEASON PRECIPITATION OVER THE SOUTHERN APPALACHIANS,
National Weather Service, Fort Worth, Tex. Southern Region.
For primary bibliographic entry see Field 2B.
W76-08414

ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W76-08510

ENVIRONMENTAL MONITORING FROM SPACECRAFT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W76-08532

ANALYSIS OF ERTS-1 IMAGERY OF WYOMING AND ITS APPLICATION TO EVALUATION OF WYOMING'S NATURAL RESOURCES,
Wyoming Univ., Laramie. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W76-08535

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT, AND DEVELOPMENT OF WATER RESOURCES,
Ecosystems International, Inc., Gambrills, Md.
For primary bibliographic entry see Field 6B.
W76-08536

THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W76-08537

UTILIZATION OF ERTS-1 DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 4A.
W76-08538

WATER USE BY SALTCEDAR AS MEASURED BY THE WATER BUDGET METHOD,
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 2D.
W76-08573

AN AQUATIC TECHNIQUE FOR COLLECTING SMALL ADULT INSECTS,
Murray State Univ., Ky.
M. E. Sisk.
J Tenn Acad Sci. 49(3), p 105-106, 1974.

Descriptors: *Insects, *Nets.
Identifiers: *Collecting technique, *Stream drift nets.

A method is described for using stream drift nets in collecting small adult insects in flowing water.--Copyright 1975, Biological Abstracts, Inc.
W76-08574

GREAT PLAINS EVAPOTRANSPIRATION BY A RESISTANCE MODEL USING REMOTELY SENSED THERMAL IMAGERY,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
For primary bibliographic entry see Field 2D.
W76-08585

MEASUREMENT OF SOIL MOISTURE IN POONA BLACK COTTON SOIL USING AN INFRA-RED MOISTURE BALANCE,
Meteorological Office, Poona (India).
For primary bibliographic entry see Field 2G.
W76-08734

7C. Evaluation, Processing and Publication

ESTIMATION BY DIGITAL COMPUTER OF THE DRAWDOWN CAUSED BY GROUNDWATER WITHDRAWAL,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4B.
W76-08140

EVALUATION OF ERTS DATA FOR CERTAIN HYDROLOGICAL USES,
National Environmental Satellite Service, Washington, D.C.
D. R. Wiesnet, D. F. McGinnis, and M. C. McMillan.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-21771, $5.00 in paper copy, $2.25 in microfiche. Goddard Space Flight Center ID No. C0313, November 30, 1974. 91 p, 56 fig, 7 tab, 48 ref. NASA 432-641-14-04-03.

Descriptors: *Satellites(Artificial), *Data collections, *Remote sensing, *Hydrologic data, Limnology, Hydrology, Runoff, Snow, Snowmelt, Lake ice, Ice, Currents(Water), Lakes, Soil moisture.

Identifiers: Snow-extent mapping, Lake currents, Flood mapping.

The Earth Resources Technology Satellite-1 (ERTS-1) with Multispectral Scanner Subsystem (MSS) data have been used in a variety of hydrologic research including snow-extent mapping; studies of snowmelt, snowmelt-runoff, spectral reflectance of snow for assessing snowpack conditions, and snow albedo; lake ice formation, breakup, and migration; lake current measurements; multispectral studies of lake ice; and flood studies. MSS sensing of soil moisture over a well-vegetated test site was unsuccessfully attempted. Although a powerful research tool, ERTS-1 has very limited use as an operational system for the hydrologic community because of its 18-day revisit cycle and its lack of a 'quick-look' capability. (Morris-ISWS)
W76-08147

ERTS-1 INVESTIGATION OF WETLANDS ECOLOGY,
American Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W76-08319

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY, PART II: NON-CONSERVATIVE SPECIES TRANSPORT MODELS,
Alabama Univ., Dept. of Chemical and Metallurgical Engineering.
For primary bibliographic entry see Field 5B.
W76-08327

DEVELOPMENT OF A THREE-DIMENSIONAL TIME-DEPENDENT FLOW FIELD MODEL,
Louisiana State Univ., Baton Rouge, Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2L.
W76-08328

THE ESTIMATION OF LOCAL RAINFALL BY SAMPLE GAUGING,
For primary bibliographic entry see Field 2B.
W76-08348

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, UNIT 2, SAN BENITO, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08376

FLOOD PLAIN INFORMATION: ALAMO AND ULATIS CREEKS, VACAVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08377

FLOOD PLAIN INFORMATION: EEL RIVER--STAFFORD TO HOLMES, HUMBOLDT COUNTY, CALIFORNIA,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08378

FLOOD PLAIN INFORMATION: SAN FELIPE LAKE, PACHECO CREEK, SAN BENITO COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08379

FLOOD PLAIN INFORMATION: SAN ANTONIO CREEK AND TRIBUTARIES, VICINITY OF OJAI, VENTURA COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08380

FLOOD PLAIN INFORMATION: PURGATOIRE RIVER AND TRIBUTARIES, VICINITY OF TRINIDAD, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-08381

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER AND TRIBUTARIES, GREAT BEND, KANSAS, TO JOHN MARTIN DAM, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-08388

FLOOD PLAIN INFORMATION: SALINE RIVER AND TRIBUTARIES, BENTON, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W76-08389

FLOOD PLAIN INFORMATION: COLORADO RIVER AND RIFLE, GOVERNMENT, HUBBARD GULCH CREEKS, RIFLE, COLORADO.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08390

MEASUREMENTS OF CURRENT FLOW DURING SUMMER IN LAKE HURON,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2H.
W76-08413

APPLICATION OF THE NATIONAL WEATHER SERVICE FLASH-FLOOD PROGRAM IN THE WESTERN REGION,
National Weather Service Salt Lake City, Utah. Western Region.
For primary bibliographic entry see Field 4A.
W76-08415

WATER RESOURCES OF THE WORLD, SELECTED STATISTICS.
Geraghty and Miller, inc., Port Washington, N.Y. Water Information Center, Incorporated, Port Washington, New York, 1975. 568 p. Compiled and edited by Fritz van der Leeden.

Descriptors: *Statistics, *Water resources, *Water supply, *Data collections, Precipitation(Atmospheric), Runoff, Withdrawal, Discharge(Water), Rivers, Reservoirs, Dams, Hydroelectric power, Groundwater, Surface waters, Municipal water, Water utilization, Water demand, Industrial water, Water pollution, Thermal water, Glaciers, Irrigation.
Identifiers: *World-wide statistics.

Because information on water availability and water use is of key importance for sound water planning and water management, these water statistics have been selected for handy reference to hydrologists, engineers, planners, developers, managers, and others. Every effort has been made to include, as far as possible, uniform data on streamflow and runoff, water demand and water use for public supply, irrigation, industry and power generation. Miscellaneous factual data of interest are also included. The tables represented reflect the nature and type of statistics available. On a world wide basis, information on streamflow proved to be fairly complete, but data on the use of water resources were found to be inadequate. A significant start has been made in putting together essential worldwide water statistics. Further editions will show an improved and broadened world-wide coverage as more material is published and cooperative efforts among nations increase. A detailed index has been provided. Statistical data are frequently found on more than one table and some overlapping material and occasional discrepancies in specific data will be noticed. In each case, however, the origin and date of the material are clearly identified on the table and in the bibliography that follows each continental section. (Sims-ISWS)
W76-08507

A RECONSIDERATION OF THE FIERING TWO-STATION MODEL,
Birmingham Univ. (England). Dept. of Mathematical Statistics.
For primary bibliographic entry see Field 4A.
W76-08519

DYNAMIC RESPONSE OF AQUIFER SYSTEMS TO LOCALIZED RECHARGE,
Chile Univ., Santiago. Centro de Recursos Hidraulicos.
For primary bibliographic entry see Field 2F.
W76-08520

ANALYSIS OF ERTS-1 IMAGERY OF WYOMING AND ITS APPLICATION TO EVALUATION OF WYOMING'S NATURAL RESOURCES,
Wyoming Univ., Laramie. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W76-08535

UTILIZATION OF ERTS-1 DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 4A.
W76-08538

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 1. SURFACE WATER RECORDS--VOLUME 2: NORTHERN GREAT BASIN AND CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif.
Data Report, 1974. 509 p, 18 fig, 1 tab, 3 ref.

Descriptors: *Water resources, *Surface waters, *Basic data collections, *Water yield, *California, Streamflow, Flow rates, Gaging stations, Reservoirs, Lakes, Elevation, Crest-stage gages.

Surface-water records for the 1974 water year for California include records of streamflow or reservoir storage at gaging stations, partial-record stations, and miscellaneous sites. Records for a few pertinent gaging stations in bordering states also are included. The records were collected and computed by the Water Resources Division of the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W76-08556

SELECTED HYDROLOGIC DATA, CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
L. J. McGreevy, and R. A. Sloto.
Open-file report, January 1976. 138 p, 2 fig, 1 plate, 7 tab, 2 ref.

Descriptors: *Groundwater resources, *Well data, *Chemical analysis, *Basic data collections, *Pennsylvania, Water levels, Aquifers, Hydrologic data, Maps, Hydrographs, Water quality.
Identifiers: *Chester County(Pa).

This report presents selected hydrologic data collected during a study of the groundwater resources of Chester County, Pennsylvania. The study was made during 1973-76 by the U. S. Geological Sur-

vey in cooperation with the Chester County Water Resources Authority. Tables include water levels, chemical analysis, and well data. (Woodard-USGS)
W76-08557

DATA ON SELECTED LAKES IN WASHINGTON, PART 3,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08564

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 3. KITSAP, MASON, AND PIERCE COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08565

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 4. CLARK, COWLITZ, GRAYS HARBOR, LEWIS, PACIFIC, SKAMANIA, AND THURSTON COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08566

RECONNAISSANCE DATA ON LAKES IN WASHINGTON--VOLUME 5. CHELAN, FERRY, KITTITAS, KLICKITAT, OKANOGAN, AND YAKIMA COUNTIES,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2H.
W76-08567

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN BRAZORIA, FORT BEND, AND WALLER COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08569

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN HARRIS AND GALVESTON COUNTIES, TEXAS, 1970-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-08570

SAVANNAH RIVER BIOLOGICAL SURVEY.
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W76-08594

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 2B.
W76-08694

TRANSIENT WATER QUALITY MODELING IN STREAMS,
Cornell Univ. Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-08730

IMPLEMENTATION OF HYDROLOGIC MODELS AT GODDARD SPACE FLIGHT CENTER.
IBM Space Systems Center, Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W76-08745

COMPUTER MAPPING OF TURBIDITY AND CIRCULATION PATTERNS IN SAGINAW BAY, MICHIGAN FROM LANDSAT DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W76-08746

8. ENGINEERING WORKS

8A. Structures

EVALUATION OF MILL TAILINGS DISPOSAL PRACTICES AND POTENTIAL DAM STABILITY PROBLEMS IN SOUTHWESTERN UNITED STATES, GENERAL REPORT, VOLUME I,
Wahler (W. A.) and Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W76-08143

NONLINEAR EARTHQUAKE RESPONSE OF CONCRETE GRAVITY DAMS,
California Univ., Berkeley. Earthquake Engineering Research Center.
For primary bibliographic entry see Field 8F.
W76-08426

SOME THEORETICAL CONSIDERATIONS IN RESERVOIR DESIGN,
Bechtel Corp., San Francisco, Calif.
For primary bibliographic entry see Field 8B.
W76-08518

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1974,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 2J.
W76-08559

FIELD PERFORMANCE OF PERMEABLE BREAKWATER,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
J. C. Ludwick, P. Fleischer, R. E. Johnson, and G. L. Shideler.
Proceedings of the American Society of Civil Engineers, Journal of the Waterways, Harbors and Coastal Engineering Division, Vol. 101, No.4, p. 357-368, 1975. 5 fig., 4 tab., 3 ref.

Descriptors: *Breakwaters, *Coastal structures, Ocean waves, *Shore protection, Virginia, Beach erosion, Sand bars, Currents(Water), Shoals, Waves(Water), On-site tests.
Identifiers: *Virginia Beach(Va).

An open-work steel breakwater was installed at Virginia Beach, Virginia, in 1973 to control beach erosion. The submerged structure, adjacent surf zone, and beach were monitored. Wave heights and longshore current speed in its lee were not diminished. No wave shadow zone was produced. It had no effect on average beach width, but there was an indication of a shoreline bulge. There was no evidence that smaller sand particles rested in its lee preferentially. An offshore bar moved 185 feet inshore and remained there. Shoaling in its lee was greater than in nearby areas. Most of the incident wave energy appeared to pass over or through the structure onto the beach. Reduction in wave action was too small to permit appreciable sand accumulation from longshore currents in its lee. Installation in shallower water nearer shore would cause more dissipation and reflection of wave energy, but would place the structure at the plunge point of some waves, necessitating increased structural strength; and might pose hazards to bathers. Reduction in wave energy required/vertical foot of sand accretion cannot be accurately calculated for a given beach at present. More knowledge is needed regarding accurate design and placement. (Buchanan-Davidson--Wisconsin)
W76-08684

8B. Hydraulics

HYDRAULIC MODEL VORTEX STUDY-GRAND COULEE THIRD POWERPLANT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
E. R. Zeigler.
Report REC-ERC-76-2, February 1976. 31 p, 35 fig, 8 ref.

Descriptors: *Vortices, Eddies, Hydraulic similitude, *Hydraulic models, *Model studies, Forebays, Hydraulic structures, Trashracks, Fluid flow, Washington, Columbia River.
Identifiers: Grand Coulee Third Powerplant(Wash).

Hydraulic model studies of the Grand Coulee Third Powerplant forebay indicated detailed vortex study should be made. Vortex modeling is difficult because of lack of similitude between model and prototype. A literature search disclosed an Equal Velocity Method of vortex modeling and this method was used in this study. Without model trashracks, air-entraining vortices readily formed and with model trashracks vortex action was reduced. Rafts either floating or submerged, suppressed vortex formation. Investigations were made to determine the prototype area in the forebay that may be susceptible to vortex action and need raft protection. (Bureau of Reclamation)
W76-08113

STABILITY AND MIXING OF A VERTICAL ROUND BUOYANT JET IN SHALLOW WATER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
J. H. Lee, G. H. Jirka, and D. R. F. Harleman.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-242 934, $6.00 in paper copy, $2.25 in microfiche. M.I.T. Energy Laboratory Report No. MIT-EL 74-014, November 1974. 135 p, 29 fig, 2 tab, 12 ref, 6 append.

Descriptors: *Thermal pollution, *Heat flow, *Hydrodynamics, *Submergence, *Stability, Froude number, Jets, Laboratory tests, Shallow water, Analytical techniques, Computer programs.
Identifiers: *Buoyant jet, Waste heat disposal.

Discharging heated water through submerged vertical round ports located at the bottom of a receiving water body is a currently used method of waste disposal. The prediction of the temperature reduction in the near field of the buoyant jet is a problem of environmental concern. The mechanics of a vertical axisymmetric buoyant jet in shallow water was theoretically and experimentally investigated. Four flow regimes with distinct hydrodynamic properties were discerned in the vicinity of the jet: the buoyant jet region, the surface impingement region, the internal hydraulic jump, and the stratified counterflow region. An analytical framework was formulated for each region. The coupling of the solutions of the four regions yielded a prediction of the near field stability as well as the temperature reduction of the buoyant discharge. It was found that the near field of the buoyant jet is stable only for a range of jet densimetric Froude numbers and submergences. A theoretical solution was given for the stability criterion and the dilution of an unstable buoyant jet. A series of experiments were conducted to verify the theory. The experimental results were compared to the theoretical predictions, and good agreement was obtained. (Singh - ISWS)
W76-08144

INTAKE MANIFOLDS AND EMPTYING VALVES FOR LOWER MONUMENTAL LOCK, SNAKE RIVER, WASHINGTON,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8C.
W76-08146

DENSE EFFLUENT DISPERSION IN A STREAM,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W76-08316

MOMENTUM TRANSFER IN HYDRODYNAMICALLY DEVELOPING LAMINAR FLOW IN A STRAIGHT CHANNEL,
Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
C. W. Savery, and M. S. Bhatti.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 316, $5.00 in paper copy, $2.25 in microfiche. Report DREX/MEM-75-12, February 1975. 81 p, 9 fig, 8 tab, 19 ref, 3 append. NSF ENG73-08125 A01.

Descriptors: *Model studies, *Laminar flow, *Channel flow, *Momentum transfer, Mathematical models, Analytical techniques, Hydrodynamics, Fluid mechanics, Flow, Viscous flow, Boundary layers, Mathematics, Computer programs, Mathematical studies, Hydraulics.

The non-linear momentum boundary layer equation was solved exactly by the technique of equation splitting. The relations between boundary layer thickness and pressure drop with core velocity were determined by applying continuity of mass across the channel. The mechanical energy equation then gave the variation of core velocity along the channel. Closed form, dimensionless expressions were obtained for all momentum transfer quantities. This analysis resulted in a fully developed, incremental pressure defect of K sub infinity = 0.5969 and an entrance length of (Xi/a) = (0.1674) Re. Predicted axial pressure drops fall within 3% of data measured by Sparrow and coworkers. Theoretical predictions of the local friction coefficient were also in good agreement with the data of Hahnemann and Ehret taken along a rectangular channel. (Sims-ISWS)
W76-08318

EXAMINATION OF THE CONCEPT AND USE OF THE STANDARD PROJECT FLOOD,
Meta Systems, Inc., Cambridge, Mass.
M. Fiering.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 190, $7.75 in paper copy, $2.25 in microfiche. Final Report, August 1974. 176 p, 23 fig, 9 tab.

Descriptors: *Design flood, *Design standards, *Design storm, *Connecticut River, *Flood control, Flood protection, Dams, Dam design, Flood recurrence interval, Probability, Statistical methods, Climatology, Probable maximum precipitation, Precipitation(Atmospheric), Hydrographs, Unit hydrographs, Rainfall disposition, Watersheds(Basins).

An attempt was made to explain traditional procedures used by the Corps of Engineers to evaluate and design flood management structures in the Connecticut River basin, focusing on the 'Standard Project Flood.' While the Corps does not intend the Standard Project Flood to be an absolute standard of performance, it was shown that this concept has developed its own momentum and its own personality over the years, as if it had some special sanctity. The report attacked this special sanctity. It was argued that economic considerations, or risk aversion, surreptitiously introduced into traditional design criteria, should be made to surface through more appropriate techniques, specifically through 'Bayesian' sensitivity analysis of the extent to which the planning process impacts the economic system it is designed to serve. (Sims-ISWS)
W76-08321

DEVELOPMENT OF A THREE-DIMENSIONAL TIME-DEPENDENT FLOW FIELD MODEL,
Louisiana State Univ., Baton Rouge, Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2L.
W76-08328

NUMERICAL COMPUTATION OF TWO-DIMENSIONAL FLOWS,
Lanchester Polytechnic, Coventry (England), Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-08341

OREGON COAST SHORELINE CHANGES DUE TO JETTIES,
Oregon State Univ., Corvallis. School of Oceanography.
P. D. Komar, J. R. Lizarraga-Areiniega, and T. A. Terich.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW1, Proceedings Paper 11933, p 13-30, February 1976. 14 fig, 16 ref.

Descriptors: *Coastal engineering, *Beaches, *Littoral drift, *Erosion, *Jetties, *Oregon, Sedimentation, Computer models, Bays, Shores, Sand spits.
Identifiers: Tillamook Bay(Ore), Siuslaw River(Ore).

Patterns of beach erosion and accretion due to jetty consruction are examined for the Oregon coast, which has a seasonally reversing littoral drift with a zero or near-zero net drift as indicated by the geomorphic and sedimentological evidence. Shoreline accretion took place adjacent to the jetty, both north and south, filling the embayments formed between the jetties and the prejetty shoreline. The amount of accretion depended on the size of the embayment created. Sand for this accretion was supplied by beach erosion at greater distances from the jetties. In the case of the jetties at Tillamook Bay, the erosion was sufficiently severe to breach Bayocean Spit. A computer model was developed to simulate shoreline changes that occurred between construction of the Siuslaw River jetties. The model demonstrated deposition next to the jetty and erosion at greater distances, showing good agreement with the actual shoreline changes. (Singh - ISWS)
W76-08342

DIMENSIONLESS SOLUTION OF DAM-BREAK FLOOD WAVES,
Patras Univ. (Greece). School of Civil Engineering.
J. G. Sakkas, and T. Strelkoff.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY2, Proceedings Paper 11910, p 171-184, February 1976. 8 fig, 9 ref, 2 append.

Descriptors: *Flood waves, *Dams, *Floods, Floodwater, Graphical methods, Hydraulics, *Mathematical models, Open channel flow, Open channels, Rivers, Streams, Unsteady flow, Waves(Water), Numerical analysis, Dam failure.
Identifiers: *Computation, Wave propagations.

A mathematical model was presented for the prediction of flood wave resulting from the instantaneous and complete failure of a dam and subsequent emptying of the reservoir into a prismatic dry channel having a parabolic cross section of arbitrary degree. It consisted of the numerical integration of the characteristic equations over the irregular grid of characteristic lines using a predictor-corrector scheme. The solution was advanced towards the wave front by a gradual refinement of the characteristics net. Over a very short region comprising the wave tip, the solution was extended to the wave front, characterized by zero depth, using a simplified form of the momentum equation resulting from physical considerations in the tip region. Computed results were compared with experimental data obtained by others. Corroboration by the experimental results was considered adequate. Dimensionless graphs of practically important flood characteristics were prepared for a wide range of channel shape, size, slope and roughness, and dam height. (Lee - ISWS)
W76-08343

SIMULATION OF HYDRAULIC PROCESSES IN OPEN CHANNELS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
C-L. Chiu, H-C. Lin, and K. Mizumura.
Journal of Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY2, Proceedings Paper 11905, p 185-206, February 1976. 13 fig, 7 ref.

Descriptors: *Channels, *Dispersion, Flow, Monte Carlo method, Fluid friction, Roughness(Hydraulic), Sediments, *Simulation analysis, Stochastic processes, Unsteady flow, Model studies, Channel flow, Mannings equation, Hydraulics, Velocity, Steady flow, Open channel flow.
Identifiers: *Secondary flow, *Stochastic models.

Techniques combining the deterministic and stochastic methods have been developed to compute and simulate various hydraulic processes in open channels, such as the three-dimensional distribution of flow velocity, steady and unsteady flows, flow resistance, secondary currents, and unsteady dispersion. The deterministic approach, using a curvilinear coordinate system based on the velocity distribution of flow, was used to deal with the basic hydrodynamic part of analysis. The stochastic approach was used to treat the irregular channel geometry that tends to cause uncertainties in simulated hydraulic processes in open channels. The techniques can be used to simulate the three-dimensional velocity distribution of (primary) flow, unsteady dispersion, and sediment transport, secondary currents, steady and unsteady flows, and flow resistance (Manning's n). In computing an unsteady flow it was found that the use of mean cross sections, without the geometrical irregularity of channel, causes errors in the peak and recession part of computed hydrographs, although it has the advantages of being simple and insensitive to uncertain Manning's n. (Lee - ISWS)
W76-08344

THERMAL-HYDRAULIC MODEL STUDY OF OFFSHORE DISCHARGE SYSTEM FOR KAHE POWER PLANT, HAWAII,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W76-08508

CHANNEL FLOW OVER PERMEABLE BEDS OF GRADED SPHERES,
Humphreys (Howard) and Sons, Reading (England).
A. F. E. Zagni, and K. V. H. Smith.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY2, Proceedings Paper 11892, p 207-222, February 1976. 9 fig, 17 ref, 2 append.

Descriptors: *Boundary processes, *Pervious soils, *Flow resistance, *Hydraulics, *Permeability, Laboratory tests, Flow, Channels, Seepage, Reynolds number, Beds, Roughness(Hydraulic).

Identifiers: *Rugosity, Slip velocity, Shear flow.

Tests were carried out to determine the velocity distribution and the hydraulic roughness in flows over 20 permeable beds made up of different sizes and gradings of spherical particles. Permeable beds were made by using lead shot or steel balls to keep the channel beds flat for a wide range of Reynolds numbers. The surface rugosity and the permeability of these beds were determined. The results showed that in flow over a permeable bed, the virtual zero of the main channel velocity profile is depressed below the bed surface or interface, resulting in finite slip velocity. Energy losses resulting from the shear flow in the bed cause the overall friction loss for a flow over a permeable bed to be greater than that for a flow over an equivalent impermeable bed. There was strong correlation between the hydraulic roughness of permeable beds and a simple parameter which included both a characteristic particle size of the bed material, and the permeability. (Singh-ISWS)
W76-08511

SOME THEORETICAL CONSIDERATIONS IN RESERVOIR DESIGN,
Bechtel Corp., San Francisco, Calif.
S. C. Mehrotra.
Journal of Hydrology, Vol. 29, No. 1/2, p 115-120, March 1976. 1 fig, 2 ref.

Descriptors: *Reservoir design, *Theoretical analysis, *Droughts, Rainfall, Probability, Mathematical studies, Cooling water, Synthetic hydrology, Reservoirs, Water storage.
Identifiers: *Theoretical considerations, *Drought duration, *Unit time distribution, Storage equation.

The concept of a critical duration of a drought of given probability of occurrence was discussed. It was also shown that the unit time distribution of a drought of a given duration and a probability of occurrence obtained first by Stall (1962) represented a sequence of events which had a lower probability of occurrence than that of a postulated event. A rigorous mathematical formulation for finding the unit time distribution was presented. (Roberts-ISWS)
W76-08518

INVESTIGATION OF ROADWAY DRAINAGE AS RELATED TO THE PERFORMANCE OF FLEXIBLE PAVEMENTS,
South Carolina Univ., Columbia, Coll. of Engineering.
T. Y. Chu, and W. K. Humphries.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-239 499, $5.00 in paper copy, $2.25 in microfiche. Final Report, August 1974. 77 p, 7 fig, 5 tab, 8 ref, 1 append.

Descriptors: *Drainage, *Roads, *Paving, Highways, Drainage engineering, Drainage systems, Seepage, Groundwater, Subsurface waters, Subsurface drainage, Tile drainage, Pipes, Tiles, Drainage practices, Gravels, Aggregates, Pervious soils, Engineering, Road construction.
Identifiers: *Flexible pavements.

The primary objectives of this study were to evaluate current practices and to investigate various alternatives for providing subsurface drainage facilities for highways in South Carolina. To this end, a survey of current design and construction practices and field investigations of subsurface drainage facilities for highways with flexible pavements were conducted. Presented in this report were findings from this study as well as discussions and recommendations in regard to the planning, design, construction, and maintenance of subsurface drainage systems. Topics concerning pavement transverse subsurface drainage, the interception of longitudinal flow of water below the pavement surface, groundwater control, and filter materials were included. (Sims-ISWS)
W76-08534

GRAPHIC DETERMINATION OF SUB-MAIN PIPE SIZE FOR SOLID-SET SPRINKLER IRRIGATION ON STEEP, NON-UNIFORM SLOPES,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-08682

PRELIMINARY HYDROLOGIC DESIGN OF SMALL FLOOD DETENTION RESERVOIRS,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
R. L. Wycoff, and U. P. Singh.
Water Resources Bulletin, Vol. 12, No. 2, p 337-349, April 1976. 5 fig, 3 tab, 4 ref.

Descriptors: *Flood routing, *Hydrologic budget, *Reservoir design, Water resources, Design, Reservoirs, Numerical analysis, Hydrology, Floods, Storage, Hydrographs, Discharge(Water), Inflow, Model studies, Detention reservoirs, Reservoir storage.
Identifiers: *Flood detention, *Hydrologic design, *Flood storage, Model verification.

A method was presented by which the volume of flood storage required for a single reservoir or a series of reservoirs could be estimated without using numeric flood-routing techniques. The procedure requires a minimum of computations and is most applicable to preliminary design situations where a high degree of accuracy is not required. In the idealized case, a watershed and reservoir system were considered where both the inflow and outflow hydrographs were triangular in shape. By using a triangular hydrograph the volume of runoff entering the reservoir was determined. By continuity, the total volume of runoff was determined by the reservoir outflow triangular hydrograph. The maximum storage volume utilized during the passage of the flood wave through the reservoir was equal to the area difference between inflow and outflow hydrographs expressed in a simple equation. In a more generalized case, where the hydrographs were curvilinear in shape, a constant and two exponents were derived empirically to fit by linear regression an equation to estimate storage required to obtain a desired outflow rate given an inflow hydrograph. Since many factors affect this relationship, the method should be considered an estimating guide. (Roberts-ISWS)
W76-08731

SUPPRESSION OF WAVES IN SLOTTED-WALLED CHANNEL,
Trinity Coll., Cambridge (England).
A. M. Binnie.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 12006, p 397-409, March 1976. 5 fig, 2 tab, 6 ref, 4 append.

Descriptors: *Model studies, *Open channel flow, *Flow characteristics, Hydraulic models, Flow, Channel flow, *Flow around objects, Waves(Water), Equipment, Hydraulics, Hydrodynamics.
Identifiers: *Wave suppression, Slots, Discontinuities.

For the study of flow past immersed objects, a channel with slotted sides and bottom and surrounded by an open chamber has advantages over the usual solid-walled channel. Previous experience has shown that the stream can be disturbed by self-induced oscillations. Experiments were described which demonstrate that the waves in the channel move upstream in synchronism with longitudinal stationary waves in the outer chamber. An approximate theory of this effect was derived. The trouble can be avoided by making the outer chamber only slightly deeper than the channel. The flow may be disturbed by self-induced oscillations. The waves were shown to move upstream in synchronism with stationary waves in the outer chamber. They can be eliminated by making the depths in the channel and the outer chamber nearly the same. (Sims-ISWS)
W76-08742

DISSIPATION OF TURBULENT ENERGY IN A NATURAL CHANNEL,
Gidrometeorologicheskii Institut, Odessa (USSR).
D. I. Grinval'd, and M. I. Zheleznyak.
Available from the National Technical Information Service, Springfield, Va 22161 as N75 17613, $3.50 in paper copy, $2.25 in microfiche. Technical Translation NRC/CNR TT-1782, Canada Institute for Scientific and Technical Information, 1974. 11 p, 3 fig, 2 tab, 7 ref. Translated from Meteorologiya i Gidrologiya, Vol 13, No 7, p 50-55, 1971.

Descriptors: *Rivers, *Turbulence, *Energy dissipation, Channels, Channel flow, Streamflow, Flow, On-site investigations, Measurement, Data processing, Analytical techniques, Fluid mechanics, Hydraulics.
Identifiers: Kolmogorov-Obukhov theory.

An effort was made to apply the Kolmogorov-Obukhov theory of locally isotropic turbulence to the study of turbulence in natural rivers. The inertial subrange was indicated and the limits were determined within which the 2/3 and -5/3 laws are fulfilled. Empirical time structural, correlative and spectral functions of the longitudinal velocity component were computed. For the first time the velocities of energy dissipation for natural streams were calculated directly from those functions. (Sims-ISWS)
W76-08744

EXIT OF GROUND WATERS ON DRAINAGE BOUNDARIES,
Ebasco Services Inc., New York.
For primary bibliographic entry see Field 2F.
W76-08750

8C. Hydraulic Machinery

RESEARCH AND DEVELOPMENT OF AN AIRBORNE HYGROSCOPIC SPRAY SYSTEM,
Mee Industries, Inc., Rosemead, Calif.
For primary bibliographic entry see Field 3B.
W76-08111

LOAD AND VOLTAGE CONTROL ALGORITHMS FOR GRAND COULEE POWERPLANT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
W. B. Gish.
Report REC-EKC-76-3, March 1976. 87 p, 35 fig, 1 tab.

Descriptors: *Supervisory control(Power), *Algorithms, Automatic control, Control systems, Computer programs, Mathematical models, Governor, Data transmission, Power system operation, Peak power, Hydroelectric power, Electric generators, Generator, Load distribution, Grand Coulee Dam, Columbia River.
Identifiers: Minicomputers, Columbia Basin project(Wash).

A load and voltage controller for managing the power output of 26 generators and the bus voltages for three high-voltage busses at the Grand Coulee Power Complex is described in detailed flow chart form. The controller is designed for inclusion in a computer-based supervisory control system. The load control is based on a closed-loop digital power controller developed especially for

hydroelectric installations. Also included is a unique twollevel load allocation system utilizing lod-frequency commands from an area automatic generation controller and features an alternating reactive-power balance and voltage setpoint algorithm. The load and voltage controllers use direct analog signals to the electrohydraulic governors and the thyristor-based excitation systems. (Bureau of Reclamation)
W76-08112

HYDRAULIC MODEL VORTEX STUDY-GRAND COULEE THIRD POWERPLANT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W76-08113

INTAKE MANIFOLDS AND EMPTYING VALVES FOR LOWER MONUMENTAL LOCK, SNAKE RIVER, WASHINGTON,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
L. Z. Perkins, and H. P. Theus.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A011 396, $4.50 in paper copy, $2.25 in microfiche. Technical Report No. 105-1, May 1975. 58 p, 26 fig, 13 tab.

Descriptors: *Hydraulic models, *Model studies, *Hydraulic similitude, *Laboratory tests, Flow, Hydraulic equipment, Gate control, Intake gates, Vortices, Intakes.
Identifiers: *Flow conditions, *Monumental Dam(Wash), *Lock chamber hydraulics, Tainter emptying valve, Hydraulic loads.

Flow conditions at proposed intakes and performance of a conventional tainter emptying valve for the navigation lock at Lower Monumental Dam were studied in a 1:25-scale model. Vortexes occurred over the land wall intake on original design during a portion of the filling operation; eddies along the river wall dissipated before a vortex could form. With the adopted intake, vortexes were absent during tests with steady flow into the lock chamber. Dimples that would indicate incipient vortexes in the model were not evident during filling operations at an initial head of 117 ft (maximum lock inflow increased 10%) when two adjacent spillway bays were closed, when both intakes were open, or when the river wall intake was closed. Intermittent dimples formed when the spillway flow averaged 10,000 cfs per bay and when the land wall intake was closed. Performance of a conventional tainter emptying valve was satisfactory. Negative pressures at the bottom corner of the trunnion support were minor; pressure surges and hydraulic loads on the valve were small. (Morris-ISWS)
W76-08146

FAN DISTURBING SAND AT THE BOTTOM OF A BODY OF WATER SO THAT IT MAY BE PUMPED UP EFFICIENTLY,
T. Araoka.
U. S. Patent No. 3,945,761, 2 p, 12 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 4, p 1855, March 23, 1976.

Descriptors: *Patents, *Bodies of water, Underwater, Hydraulic equipment, Hydraulic mining, Sands.
Identifiers: Fans.

The invention relates to a fan for hydraulically disturbing sand which is to be pumped up by sand pumps from the bottom of a body of water. The fan is comprised of a central supporting member having a frusto-conical outer surface which is larger at its upper than its lower end. A number of vanes are attached along their inner edges to the outer surface. The vanes are circumferentially distributed about the supporting member and extend for a uniform distance from the frustoconical surface throughout their lengths. The lower part of each vane is substantially straight while its upper part is curved toward the direction of rotation of the fan. (Sinha - OEIS)
W76-08205

PUMPS FREE CITY FROM LAKE ERIE FLOODING.
The American City, Vol. 88, No. 9, p 116-117, September, 1973. 2 fig.

Descriptors: *Drainage system, *Pumps, *Storm runoff, Construction, Sewers, Floods, Overflows, Lake Erie.
Identifiers: Luna Pier(Mich), Catch basins.

A new drainage system in the low lying sections of Luna Pier, Michigan, is partially completed resulting in storm overflow disappearance within two hours. The key to the new system is a pair of single-pit pumping stations. Each contains two Flygt submersible pumps rated at 2500 gpm per unit. Pump controls, mounted in a weather-tight panel above ground at each station, are programmed to operate the pumps on alternate cycles. Liquid level sensors control pump operation. The cross-section of street pavements has been modified in those areas subject to flooding so that they are constructed with a valley or swale in the center. This permits the use of only one catch basin at each intersection (instead of four) and only one sewer line running along the center of the street. (Sandoski-FIRL)
W76-08250

'WE'VE FOUND A REAL TIME-SAVER',
Mansfield Sewage Treatment Plant, Ohio.
D. Covant.
Water and Wastes Engineering, Vol. 10, No. 10, p 44, October, 1973. 1 fig.

Descriptors: *Maintenance, *Pumps, Pumping, Sewage, Equipment, Joints(Connections), Ohio, Waste water treatment.
Identifiers: Couplings.

A new slide-away sewage pump coupling has reduced periodic maintenance check downtime at the Mansfield, Ohio, Sewage Treatment Plant from several hours to about thirty minutes. The time saving is due to the combination of stationary and movable coupling faces that can be disconnected in minutes as opposed to hours in conventional sewage ejector installations. The Peabody Barnes coupling automatically guides the pump into operating position when it is lowered into the pit. With this new installation, using a one-ton block and tackle, a two-man maintenance team can lift the pump, clean it, and drop it back into position; it is no longer necessary to drain the pit or unbolt the pump from its connections. (Sandoski-FIRL)
W76-08251

ENGINEERING AND ECONOMIC STUDY OF REVERSE OSMOSIS SEA WATER DESALTING PLANTS, DESIGN OF 1-10 MGD SEAWATER PLANTS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-08284

OCEAN THERMAL ENERGY CONVERSION.
Energy Digest, Vol. 4, No. 5, p. 4-14, 1975. 9 fig.

Descriptors: *Oceans, *Electric power, *Solar radiation, Design data, Tropical regions, Electric power plants, *Energy conversion.

An ocean thermal energy conversion system (OTEC) to generate electric power, designed for siting in tropical regions up to 80 miles offshore, is described. The baseline power plant configuration consists of four power-generating modules attached to a semi-submersible spar-type platform and provides bouyancy for the entire system. The vertically oriented platform offers the advantages of excellent stability, adaptability to a modular concept, simplicity of cold-water pipe deployment, ease of separating different-temperature effluents, virtual invulnerability to damage by surface vessels, is capable of surviving hurricane conditions, and is constructed of materials and processes currently well known to industry, promising a 100-year life of continuous operation. It offers an alternative to transmitting energy from the OTEC plant to the consumer by the option to bring the power-consuming process to the plant thus industrial processes that may be hazardous or polluting ashore, or that compete for critical land uses, may be feasible afloat. A demonstration is projected in 1981, and on-line four-module plant in 1986, and the availability of 1000 MWe by the end of 1900. Construction and deployment of successive plants are possible at a rate of one per year following the first delivery in 1987, each with a projected power output of 186 MWe net. (Auen-Wisconsin)
W76-08366

FIELD EVALUATION TESTING OF REVERSE OSMOSIS HIGH PRESSURE PUMPS AND ENERGY RECOVERY TURBINES.
Catalytic, Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 3A.
W76-08372

WATER FILTER ASSEMBLY,
H. D. Lipner.
U. S. Patent No. 3,935,106, 5 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 942, No 4, p 1875, January 27, 1976.

Descriptors: *Patents, *Water treatment, *Water quality control, *Water pollution treatment, *Filtration, *Filters, Valves, Safety.

The water filter assembly described eliminates the necessity for using two separate valves, one to shut off the stream of water entering the filter and the other to prevent back flow of water from the water line. Both of these functions are accomplished in one simple rotational operation by the use of a single valve assembly. The filter element may be easily and quickly changed with only a partial rotation of a valve rotor within its housing. A reciprocal rotation of the valve rotor again opens the filter to the incoming and outgoing streams of water. The invention also provides for a safety feature which when the rotor is rotated from its filtering position, permits the stream of water from the community line to bypass the filter element, should the filter tank become damaged or otherwise become inoperative. An atomatic vacuum relief mechanism releases the vacuum occuring within the filter tank when the rotor is placed in bypass position. (Sinha-OEIS)
W76-08392

APPARATUS FOR PUMPING OIL-WATER MIXTURE FROM A COLLECTION VESSEL OF A FLOATING OIL COLLECTOR INTO SETTLING TANKS,
For primary bibliographic entry see Field 5G.
W76-08403

DESALTING HANDBOOK FOR PLANNERS.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 3A.
W76-08584

USE OF SURFACE-ACTIVE CHEMICALS IN PUMP-ASHORE SCHEMES AND SUCTION DREDGERS,
Atomic Energy Research Establishment, Harwell (England).
P. Biddle, and J. H. Miles.
Available from the National Technical Information Service, Springfield, Va 22161 as AERE-R-6816-Rev, $4.50 in paper copy, $2.25 in microfiche. Report AERE - R 6816 (Revised), January 1975. 61 p, 14 tab, 30 fig, 2 append.

Descriptors: *Surfactants, *Dredging, *Silts, Sands, Mud, Marl, Chemical precipitation, Cores, Laboratory tests, Bearing strength, Flocculation, Dewatering, Waste water treatment.
Identifiers: *Surface-acting agents, *Suction dredges, *Pilot-scale tests, Polyacrylamide flocculant, *Mud suspensions, Port dredging operations, Sodium carboxymethyl cellulose.

Surface-active agents added to mud or silt accelerate dewatering and consolidation. Laboratory tests and pilot-scale trials were carried out using mainly Thames 'black mud' combined with either a flocculating agent (polyacrylamide PAM) or a protective colloid (sodium Carboxymethyl cellulose (SCMC). Measurements were made of settling rates, packing densities, rate of loss of water, and increase in bearing strength of mud beds. The effects of salinity, origin of mud or silt, ionic character of PAM, and variation in mud concentration on settling rates have been determined. There are discrepancies between this work and some later results which had not been cleared up, but may have been due to differences in the mud samples used. It was found that while SCMC had little effect, PAM accelerated dewatering and consolidation in the early stages. For application to pump ashore schemes the consolidation will need to be studied on a large scale over a much longer period (years). In suction dredging the benefit would be in increasing the payload by increasing the density of spoil in the dredger, but flocculant requirements are high in concentrated mud suspensions, and the figures in this work suggest that it was not economic. (Roberts-ISWS)
W76-08747

8D. Soil Mechanics

DERIVATION OF A MODEL RAIN FOR THE DIMENSIONING OF SEWER SYSTEMS (ENTWICKLUNG EINES BERECHNUNGSREGENS FUER DIE BEMESSUNG VON KANALNETZEN),
For primary bibliographic entry see Field 5D.
W76-08253

PORE SIZE DISTRIBUTION OF COMPACTED SOILS AFTER CRITICAL REGION DRYING,
Purdue Univ., Lafayette, Ind. Joint Highway Research Project.
For primary bibliographic entry see Field 2G.
W76-08416

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME I.
Held at Sao Paulo, Brazil, 18-24 August 1974. Organized by Associacao Brasileira de Geologia de Engenharia, Sao Paulo, Brasil.

Descriptors: *Engineering geology, *Conferences, Seismology, Seismic properties, Soil properties, Soil engineering, Soil mechanics, Mapping, Rock fill, Testing procedures, Sandstones.

--Papers on the following themes are presented in this volume: I, Teaching and Training in Engineering Geology; II, Seismic Phenomena and Engineering Geology; III, Engineering Geology Related to Urban and Country Planning; IV, Engineering Properties and Classification of Natural Materials of Construction. Partial contents: Seismic Phenomena and Engineering Geology, by L. E. Oborn. Artifically Induced Seismicity and Associated Ground Motions, by S. K. Guha, and others. Microzonation in Relation to Engineering Soil Properties, by M. A. Sherif, and others. A Systematic Approach to Mapping Engineering Geology, by K. Grant. Negative Strength Regions in Offshore Construction, by R. C. Bostrom and M. A. Sherif. Soft Sandstones: Geotechnical Properties and Sensitivity to Moisture Changes, by M. E. Barton. Rockfill Testing in a Large Direct-Shear Device, by J. Dobr and A. Rozsypal. (See also W76-08418) (WES)
W76-08417

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME 2.
For primary bibliographic entry see Field 8E.
W76-08418

IMPROVEMENT OF CORE DRILL METHODS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. L. Gatz.
--Miscellaneous Paper No. S-75-17, June 1975. 35 p.

Descriptors: *Cohesionless soils, *Core drilling, New Mexico, Gravels, Sampling, Testing procedures, Cores.
Identifiers: Denison samplers, Membrane samplers.

--Results are presented of a program to evaluate effectiveness of more or less conventional subsurface samplers in obtaining representative and undisturbed samples of noncohesive alluvial materials containing large quantities of gravels and cobbles. This is the first phase of a research program to improve core drill methods. Samplers evaluated consisted of the Lawrence Livermore Laboratory membrane sampler, 4-in. Denison sampler, 6-in. Denison sampler, 5-in. Modified Denison sampler, and 3-in. thin-wall drive tube. Small representative samples were obtained with the Denison samplers; no undisturbed samples were obtained. The field work was accomplished in the Rhodes Canyon area, White Sands Missile Range, New Mexico. (WES)
W76-08419

PROPERTIES OF EXPANSIVE CLAY SOILS; REPORT 2, A NUMERICAL PROCEDURE FOR PREDICTING HEAVE WITH TIME,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. D. Johnson, and C. S. Desai.
--Miscellaneous Paper No. S-73-28, April 1975. 57 p, 33 ref.

Descriptors: *Heaving, *Finite difference analysis, Computer programs, *Testing procedures, *Clays, Soil properties.
Identifiers: *Expansive clays, *Soil swelling.

--A relatively economical and expedient numerical procedure and computer code based on the finite difference method were developed for predicting heave with time for heterogeneous expansive soils beneath structures idealized as two-dimensional. The computer code will also compute the potential heave assuming saturation of the foundation soils based on McDowell's swell data. The heave with time estimates should be useful for structures near which penetration of rainwater from the ground surface is permitted, provided that ponding of surface water and external water from leaking water and sewer lines does not occur. The required input data include the structural load, specific gravity, liquid and plastic limits, initial dry density and water content, coefficient of vertical permeability, ratio of the horizontal to the vertical coefficient of permeability, and swell and suction relationships of the foundation soils. (WES)
W76-08420

ARTIFICIALLY SIMULATING THE GEOLOGICAL HISTORY OF CLAY,
Imperial Coll. of Science and Technology, London (England).
J. L. Knill.
Prepared under contract for Final Technical Report, United States Army, European Research Office, (London) July 1974. 204 p, 80 ref.

Descriptors: *Clays, Simulation analysis, *Consolidation, Measuring instruments, *Geologic history, *Soil compaction, *Pore pressure, Pore water, Testing, *Soil tests, Strain measurement.
Identifiers: Artificial simulation(Soils), Clay sediments.

Report is concerned with the description of the development and research application of a high pressure consolidation cell, designed to simulate the progressive burial of clay sediments. The cell is described in detail by reference to the pre-July 1973 and July 1974 states of mechanical and electrical development. Results of a series of nine high pressure tests, four low pressure tests with elevated temperature and four constant rate of strain tests are presented. These results include information on the e-log p, relationships, variations in pore pressure and pore water chemistry and fabric changes preliminary explanations of the observed phenomena are offered. Attention is drawn to geological implications and reference also made to future trends in the research program. (WES)
W76-08421

SOIL STABILIZATION WITH POWDERED AND COARSE QUICKLIME,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
W. C. Allanach, Jr.
Master's thesis, 1974. 70 p, 15 ref.

Descriptors: Lime, *Soil stabilization, *Clays, *Compressive strength, *X-ray diffraction, Infrared radiation, Spectroscopy, *Electron microscopy, Analytical techniques.
Identifiers: Quicklime, *Infrared spectroscopy.

Study of the relative stabilizing effects of coarse and powdered quicklime on clay was accomplished using strength gain as the basis of comparison as determined by an unconfined compression test. Correlation of strength gain with alteration of the clay fabric an identification of reaction products formed was made possible through the use of X-ray diffraction, infrared spectroscopy, and electron microscopy. The powdered quicklime showed the greatest strength gain which was attributed to its higher degree of dispersion throughout the lime-clay-water system. This was confirmed by the micromorphologic studies showing altered clay fabric over a larger area of the specimens than in the coarse quicklime-treated specimens. The most distinctive reaction product, calcium-silicate hydrate, CSH, as viewed with the electron microscope, also showed more uniform distribution in the powdered quicklime-treated samples. (WES)
W76-08422

APPLICATION OF THE FINITE ELEMENT METHOD IN FOUNDATION ENGINEERING (DIE ANWENDUNG DER METHODE DER FINITEN ELEMENTE IN DER GRUNDBAUPRAXIS),
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
R. F. Buchmaier.
Report KFK-CAD 1, December 1974. 170 p, 49 ref.

Descriptors: *Finite element analysis, Design, *Soil stability, *Seepage, *Soil dynamics, *Soil compaction, Soil mechanics, *Foundation investigations.
Identifiers: Soil statics.

A summary is presented of the possibilities of applying finite element techniques (FEM) to foundation engineering problems. Theoretical aspects and the special limitations as well as the techniques of dealing with time-dependent and nonlinear problems are considered. The inherent mechanical behavior of soils and its input into the numerical procedure are discussed with reference to problems of soil statics, seepage, consolidation, and soil dynamics. Each type of problem is documented by examples. In addition, existing FEM programs have been listed resulting from an international request. Results of the study are planned to be implemented into future research organization of FEM development in the field of foundation engineering. (WES)
W76-08423

EARTH PRESSURE OBSERVATIONS ON A RETAINING WALL IN EXPANSIVE CLAY, GOUGHER STREET MAIL EXCHANGE, ADELAIDE,
Commonwealth Scientific and Industrial Research Organization, Camberra, Australia, Division of Applied Geomechanics.
M. Kurzeme, and B. G. Richards.
Technical Report N. 17, 1974. 45p.

Descriptors: *Earth pressure, Measurement, *Retaining walls, *Clays, *Soil pressure, Hygrometry, *Pressure measuring instruments, Australia, Testing, Testing procedures.
Identifiers: Expansive clays, Psychometers, Pressure cells(Soils).

A section of a basement retaining wall in Adelaide, 25m long and 7.5m high, has been extensively instrumented. Basement is located in a moisture-sensitive expansive clay subjected to changes in the moisture environment. Instrumentation comprises 24 earth pressure cells at the wall/clay interface and 31 psychrometers in clay mass behind the wall. Earth pressures are being measured, together with changes, in the moisture environment, for comparison with current design assumptions, and with predictions from more advanced methods of modeling the interacting retaining wall/clay system. Instrument installation was accompanied by a comprehensive sampling and laboratory testing program, design to measure material properties relevant to available models of material behavior. Results of the laboratory testing and the field observations for the first two years are presented and discussed. (WES)
W76-08424

SCHRIFTENREIH, (OTTO-GRAF-INSTITUT), (IN GERMAN).
Stuttgart Univ. (West Germany). Otto-Graf-Institut.
Report No. 64. Stuttgart, 1974.

Descriptors: *Slope stabilization, *Plastic deformation, *Underground construction, *Slope protection, Electro-osmosis, Drains, *Soil tests, *Soil analysis, Sampling.
Identifiers: Drainholes.

This publication contains papers written by the staff of the Otto-Graf-Institut in 1970-73. Contents include: Sanierung von Boschungsrutschungen durch Anwendung von Horizontal-Drainagebohrungen und Elektroosmose (Prevention of Slope Slides by the Application of Horizontal Drainholes and Electroomosis), by K. F. Henke. Steifenkraftmessungen beim U-Bahn-Bau in Stuttgart (Stiffness Measurements for the Subway Construction in Stuttgart), by K. F. Henke. Die Mechanisierung der Bodenprobenaufbereitung und der Bestimmung der Ausrollgrenze nach Atterberg (Mechanization of the Preparation of Soil Samples and Determination of Plastic Limit According to Atterberg), by W. Kaiser and G.C.W. Gay. Ein Verfahren zur Ermittlung der Steifeziffer des Bodens in naturlicher Lagerung (Procedure for Determining Stiffness Coefficient of Soil under Natural Bedding Conditions), by K. F. Henke, and others. (WES)
W76-08425

EVALUATION OF BENTONITE CLAY FOR WATERPROOFING FOUNDATION WALLS BELOW GRADE,
Construction Engineering Research Lab. (Army), Champaign, Ill.
S. M. Kanarowski.
Technical Report M-93, May 1975. 48 p.

Descriptors: *Waterproofing, *Foundations, *Bentonite, *Clays, Evaluation, Cost comparisons.
Identifiers: Bentonite clay panels, Bentonite spray.

Bentonite clay panels and bentonite spray are evaluated for waterproofing the exterior surface of foundation walls below grade. The evaluation is based on a field letter survey and contacts with users, architects, and installers of bentonite panels; and users, architects, contractors, and applicators of bentonite spray. Two installations were observed to provide first-hand data. Both bentonite systems performed favorably at a cost comparable to conventional systems, but lower than most elastomeric systems. Installation is easy and fast and both systems can be backfilled immediately after application. Product information, including responses from the field, cost comparisons, and advantages and limitations for both materials, is given. (WES)
W76-08427

8E. Rock Mechanics and Geology

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME I.
For primary bibliographic entry see Field 8D.
W76-08417

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME 2.
Held at Sao Paulo, Brazil, 18-24 August 1974. Organized by Associacao Brasileira de Geologia de Engenharia, Sao Paulo, Brazil.

Descriptors: *Engineering geology, *Conferences, *Dam foundations, *Underground structures, *Rock mechanics, Rock properties, Concrete, Corrosion, Tunnels, Slopes, Shear strength, Stress.

--Papers on the following themes are presented in this volume: V, Mass Movements; VI, Engineering Geology Related to Dam Foundations; VII, Engineering Geology and Underground Construction. Partial contents: Rock Stability Analysis: Discontinuities Shear Strength Parameters and Prestressing Costs, by M. D. Ruiz. Experimental Approach to the Study of Mechanisms of Structural Controlled Slope Movements in Rock Masses, by W. L. Furlinger. Stabilization of Landslides in Weathered Clay-Shale Using Pretensioned Grouted Anchors, by K. F. Henke. Geological Models of Development of Seepage Soil Deformations in Poland, by J. Liszkowski: Engineering Geology Related to Dam Foundations, by J. L. Knill. Geological Investigation of Sao Simao Dam (Brazil), by S. Brito, and others. Engineering Geology and Underground Construction, by D. U. Deere, and others. Investigations on Concrete Corrosion in the Sao Paulo Metro, by N. J. Chiossi. (See also W76-08417) (WES)
W76-08418

8F. Concrete

POLYETHYLENE PIPE SOLVES PROBLEM OF FORCE MAIN SEWER LINE INSTALLATION ACROSS INLAND WATERWAY.
Water and Sewage Works, Vol. 120, No. 8, p 54-55, August, 1973. 2 fig.

Descriptors: *Sewers, *Construction, Channels, Plastic pipes, Installation, Sewerage, Joints(Connections), Concrete structures, New Jersey.
Identifiers: Wildwood(NJ), Polyethylene pipe.

The installation of a force main sewer across the Middle Thorofare Channel in Wildwood, New Jersey, required less than six hours. The 1320-foot long, 14-inch diameter line now connects Diamond Beach to the area's main sewer. Guard boats stood watch on both approaches to the channel as a wire cable, pulled by a truck-mounted winch, hauled the high density polyethylene plastic pipe across the waterway. Concrete collars were placed around the circumference of the pipe to sink it. When the pipe reached its destination on the north bank of the channel, it was filled with water to further aid in the sinking process and settled into an already prepared trench, four feet deep. The flexibility of the pipe permits it to contour to the channel bottom. The entire 1320-foot length of pipe in 40-foot sections was joined in two days by a three-man crew. Joining the sections required from 20 to 25 minutes for each joint of this particular diameter. (Sandoski-FIRL)
W76-08236

HALF-SECTION PIPE USED EFFECTIVELY,
A. R. Pagan.
Public Works, Vol. 104, No. 10, p 94, October, 1973. 3 fig.

Descriptors: *Construction, *Drainage systems, Concrete pipes, Highways, Outlets, Outfall sewers, Flow, Concrete construction, New Jersey.
Identifiers: Paramus(NJ).

In extending a highway in Paramus, New Jersey, the outfall from part of the drainage system consisted of half-section reinforced concrete pipe. The half-sections were bedded on a 2-foot thick by 8-foot wide cushion of 1.5-inch broken stone, which was shaped to the curvature of the pipe to allow 12-inch stone imbedding. This procedure provided both a satisfactory support for the pipe and its immobility during other construction operations in the vicinity. A reasonable capacity for a section of this size on the slope given is approximately 75 cfs. This would indicate a depth of flow of about 18 inches and provide nine inches of freeboard. (Sandoski-FIRL)
W76-08237

FAST REPLACEMENT OF A FLOOD-DAMAGED INTERCEPTOR,
Metropolitan Denver Sewage Disposal District No. 1, Commerce City, Colo.
W. E. Korbitz, J. L. Puntenney, and A. M. Holst.
Public Works, Vol. 104, No. 10, p 95-96, October, 1973. 2 fig.

Descriptors: *Flood damage, *Interceptor sewers, Repairing, Public health, Reinforced concrete, Concrete pipes, Sewerage, Costs.
Identifiers: Sewer repair.

On May 6, 1973, flood waters in the Metropolitan Denver area washed out more than 200 feet of interceptor sewer. This damage required immediate action by the District to protect the public health

and to save the sewerage facilities. The actual repair work began on May 12; the pipe repair portion of the work was completed so that flow returned to the sewer on May 20. As much of the bolted pipe as was usable (112 feet) was salvaged for replacement and the amount of standard reinforced concrete pipe (120 feet) needed to complete the project was purchased. A reinforced concrete base was first constructed to support the pipe which was placed on the base the following day. A steel reinforced concrete encasement was poured around the pipe. The pipe replacement work and sewer cleaning work were accomplished in accordance with the provisions of a negotiated incentive contract. The actual total cost for the pipe replacement and sewer cleaning work was about $34,100, well below the original engineering estimate of $50,000. (Sandoski-FIRL)
W76-08240

NONLINEAR EARTHQUAKE RESPONSE OF CONCRETE GRAVITY DAMS,
California Univ., Berkeley. Earthquake Engineering Research Center.
N. Pal.
Report No. EERC 74-14, December 1974. 88 p, 40 ref.

Descriptors: *Earthquake engineering, *Concrete dams, Cracks, *Gravity dams, Dynamics, Stress, *Mathematical models, Simulation analysis, Earthquakes, Concrete testing, Strain measurement, Mechanical properties.

A mathematicl model is proposed for the mechanical properties -- constitutive relation and strength -- of concrete subject to dynamic cyclic reversible stresses and strains that may occur in gravity dams subjected to earthquake ground motion. The model describes properties of concrete under a two-dimensional state of stress. The effects of strain rate on the mechanical properties are incorporated in the model. Experimental results available in the literature form the basis for the proposed model. A method is developed for nonlinear analysis of response of concrete gravity dams to earthquake ground motion wherein mechanical properties of concrete are defined by the mathematical model. Earthquake analyses reveal that cracking of concrete is confined to areas near the upstream and downstream faces of dams -- especially in the upper parts and in some cases also near the heel. It is demonstrated that the extent of cracking in dams is quite sensitive to the mechanical properties of concrete. (WES)
W76-08426

8G. Materials

UNDERGROUND DETENTION FOR STORM OVERFLOWS.
Public Works, Vol. 104, No. 10, p 116, October, 1973. 1 fig.

Descriptors: *Underground structures, Combined sewers, Storm water, Plastics, Storage, Sewerage, Waste water treatment, Weirs, Storm runoff, Sewerage, Municipal wastes, Construction materials, Detention reservoirs.

An underground, plastic-encased basin of sand and gravel has been designed and engineered. The patented 'Geo-Cel' concept is intended to give partial treatment and to hold pollutants flushed from combined sewers in the first twenty minutes of a storm. The first such facility is being installed at Akron, Ohio. The detention basin was constructed by lining a pit with Goodyear's leakproof 30-mil Vinaliner sheeting and filling it with sand and gravel to within three feet of the surface. The gravel was then covered with 10-mil Vinaliner and earth fill placed to original grade. A concrete clarification chamber was built at one side of the detention basin. Storm-flushed material from the combined sewer enters the clarification chamber where chlorine is added and some solids settle out. Waste water then passes over a weir into the Geo-Cel for storage. When the storm subsides, the Geo-Cel's contents are returned to the city's sewer system for complete treatment at a municipal plant. Cost is said to be less than one-third that of a conventional treatment facility and the system has a design life of 25 to 40 years. (Sandoski-FIRL)
W76-08234

SAFEGUARD FLUID-HANDLING EQUIPMENT WITH PIPELINE BASKET STRAINERS,
Hayward Mfg., Co., Inc., Elizabeth, N. J.
H. Paitchell.
Plant Engineering, Vol. 27, No. 19, p 120-123, September 20, 1973. 5 fig.

Descriptors: *Pipelines, *Equipment, Cleaning, Pipes, Construction materials, Screens.
Identifiers: Basket strainers.

A simple device designed to protect fluid handling equipment, avoid shutdowns, and ensure cleaner products is the basket strainer. Because it has no moving parts to wear out, a basket strainer virtually lasts forever. Basket strainers are installed in liquid lines that require regular or frequent cleaning and hold considerably more material and produce less pressure drop than Y-strainers. Basket strainers, installed upright in a horizontal run of pipe, usually are larger in diameter than the size of the pipeline. For cleaning, the basket is lifted out from the top, a practice especially useful when the filled basket is heavy. The efficiency of a basket strainer depends on how well it is matched to the application. Several points to be investigated prior to selecting a strainer include: ratio of screen area to pipe area, size of strainer openings, basket cleaning requirements, overall size, and construction materials. (Sandoski-FIRL)
W76-08235

PORE SIZE DISTRIBUTION OF COMPACTED SOILS AFTER CRITICAL REGION DRYING,
Purdue Univ., Lafayette, Ind. Joint Highway Research Project.
For primary bibliographic entry see Field 2G.
W76-08416

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME I.
For primary bibliographic entry see Field 8D.
W76-08417

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, PROCEEDINGS OF THE SECOND INTERNATIONAL CONGRESS, VOLUME 2.
For primary bibliographic entry see Field 8E.
W76-08418

IMPROVEMENT OF CORE DRILL METHODS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W76-08419

PROPERTIES OF EXPANSIVE CLAY SOILS; REPORT 2, A NUMERICAL PROCEDURE FOR PREDICTING HEAVE WITH TIME,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W76-08420

ARTIFICIALLY SIMULATING THE GEOLOGICAL HISTORY OF CLAY,
Imperial Coll. of Science and Technology, London (England).
For primary bibliographic entry see Field 8D.
W76-08421

SOIL STABILIZATION WITH POWDERED AND COARSE QUICKLIME,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 8D.
W76-08422

APPLICATION OF THE FINITE ELEMENT METHOD IN FOUNDATION ENGINEERING (DIE ANWENDUNG DER METHODE DER FINITEN ELEMENTE IN DER GRUNDBAUPRAXIS),
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
For primary bibliographic entry see Field 8D.
W76-08423

EARTH PRESSURE OBSERVATIONS ON A RETAINING WALL IN EXPANSIVE CLAY, GOUGHER STREET MAIL EXCHANGE, ADELAIDE,
Commonwealth Scientific and Industrial Research Organization, Camberra, Australia, Division of Applied Geomechanics.
For primary bibliographic entry see Field 8D.
W76-08424

SCHRIFTENREIH, (OTTO-GRAF-INSTITUT), (IN GERMAN).
Stuttgart Univ. (West Germany). Otto-Graf-Institut.
For primary bibliographic entry see Field 8D.
W76-08425

EVALUATION OF BENTONITE CLAY FOR WATERPROOFING FOUNDATION WALLS BELOW GRADE,
Construction Engineering Research Lab. (Army), Champaign, Ill.
For primary bibliographic entry see Field 8D.
W76-08427

OUTFLOW FROM VARIOUS SUBSURFACE DRAINAGE MATERIALS,
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 4A.
W76-08669

8I. Fisheries Engineering

PERFORATED-PIPE WATER INTAKE FOR FISH PROTECTION,
Burns and Roe, Inc., Hempstead, N. Y.
R. T. Richards, and M. J. Hroncich.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY2, Proceedings Paper 11900, p 139-149, February 1976. 12 fig, 1 ref.

Descriptors: *Intakes structures, *Fish barriers, *Screens, *Hydraulics, *Laboratory tests, Velocity, Maintenance, Uniform flow, Fish conservation, Design, Fish handling facilities.
Identifiers: *Internal perforated sleeve, Approach velocity.

Since a major concern in the design of pumping station water intakes is the possibility of damage by fish drawn into the facility, some kind of screening system must be installed to minimize or eliminate this possibility. The potentially adverse impact of water intakes is resolved by the implementation of physical screens, which exclude all debris, including fish. The germane difficulties of screens, i.e., the necessity of lowering the approach velocity, poor velocity distribution across the screen, and danger to fish are overcome by the

installation of a perforated-pipe inlet with an added internal perforated sleeve. The benefits of such a device, i.e., relative ease of maintenance, uniform approach velocity, uniform inflow, and protection for fish, cannot be equalled by ordinary means of physical screening. For water intakes up to 100,000 gal/min, the inner sleeve type of perforated-pipe intake provides a viable solution to the problem of screening. (Singh-ISWS)
W76-08137

DEVELOPMENT TRENDS IN METHODS USED TO MODEL POPULATIONS AND COMMUNITIES,
V. V. Mehshytkyh.
Available from the National Technical Information Service, Springfield, Va 22161 as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. National Science Foundation Technical Translation 73-55111, 1975. 306 p. 71 fig., 15 tab., 304 ref. Trans. of Matematicheskoye Modelirovaniye Populatsii I Soobshchestv Vodnykh Zhivontnykh, Nauka, Leningrad, 1971.

Descriptors: *Productivity, *Model studies, *Methodology, *Mathematical models, *Biological communities, *Fish populations, Energy transfer, Monte Carlo method, Lakes, Algorithms, Digital computers, Graphical methods, Competition, Ecosystems, Aquatic animals.
Identifiers: USSR.

The most efficient mathematical models of aquatic animal populations and communities use electronic digital computers. Models of aquatic ecology are described which were used to verify hypotheses and indicate new dependencies and correlations. They can determine, specify, and predict population and community characteristics which cannot be measured directly. A model of perch populations explains perch population structure and predicts structures in other lakes with different ecologies, showing that computer modelling of real populations can solve practical fishing problems. A cybernetic experiment using a model permitted study of population properties; characteristics common to all populations can be calculated from knowledge of development of individuals and external conditions. Graph theory methods were applied to trophic networks in aquatic animal communities. Modelling necessitated development of specialized algorithmic language of community structure and complexity. Examples demonstrate how complex and unexpected reciprocal dynamics of even simple populations are. Fish fry mortality was studied using a model of diatoms and perch populations. A model of a pelagic fish community was used to examine some theories. This work demonstrates, by taking a series of theoretical and practical examples of modeling, that joint interdisciplinary efforts can solve the problem of rational exploitation of resources. (Buchanan-Davidson--Wisconsin)
W76-08212

DEVELOPMENT TRENDS IN METHODS USED TO MODEL POPULATIONS AND COMMUNITIES,
V. V. Mehshytkyh.
Available from the National Technical Information Service, Springfield, Va 22161, as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-55111, 1975, p. 7-58. 9 fig.

Descriptors: *Model studies, *Mathematical models, *Systems analysis, *Methodology, *Fish populations, *Biological communities, Ecosystems, Computers, Input-Output analysis, Aquatic animals, Environmental effects, Mortality, Fish reproduction, Equations, Foreign research.

The basis of modeling is the application of cybernetic conceptions and ideas and of general systems theory. The principal traits and properties necessary for practical application to populations of aquatic animals are outlined. Each system consists of interrelated elements which form a single whole. The environment acts on systems by inputs, and the system acts on the environment through outputs. This study was limited to interrelationships, inputs, and outputs of food-fish populations. Study of properties characterizing populations and communities of aquatic animals was approached from a systems point of view. The most common, efficient, and often the only possible method of investigating such systems is modelling--a practical or theoretical method permitting use of a secondary, natural, or artificial system (model) that reflects the object investigated. Using predetermined mathematical models of populations and communities, the substance, peculiarities, defects, and advantages of continuous-continuous, discrete-continuous, and discrete-discrete models for study of natural mortality among fish can be determined. Mathematical models of aquatic animal populations using differential equations are the most common and best defined methods available. Mathematical models of communities and ecosystems are analyzed; the most efficient and promising method is based on finite differences equations and uses electronic computers. (Buchanan-Davidson--Wisconsin)
W76-08213

THEORETICAL BASES OF MODELLING OF POPULATIONS AND COMMUNITIES OF AQUATIC ANIMALS,
V. V. Mehshythyh.
Available from the National Technical Information Service, Springfield, Va 22161, as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-5511, 1975, p. 59-89. 1 fig., 1 tab.

Descriptors: *Methodology, *Model studies, *Mathematical models, *Populations, *Biological communities, *Aquatic animals, Ecology, Time, Kinetics, Reproduction, Energy transfer, Foreign research.

Precise definitions and quantitative interpretations of ecological concepts are necessary for construction of mathematical models of populations and communities of aquatic animals. Models in which the main relationships between individuals or populations are the energy transfer are analyzed. These models represent certain systems including separate elements; the state of a system is determined by selection of its variables and examined in units of time. Input is examined in the same time units. The system interacts with the medium (system output). Model construction consists of establishing relationships between state of the system in the preceding moment of time, input, state at a given time, and output. Concepts, definitions, and relations needed to construct models of populations and communities of aquatic animals are described. The state of the individual has the following components: existence, development stage, age, sex, body mass, and caloric value. Input consists of medium temperature, food required, consumption of individual by a predator, capture by fishing, death from other sources, and/or relationships between egg-laying by another and appearance of this individual. Output consisted of metabolic energy, food required, eggs spawned, and excretions. Reproduction relationships between individuals are described. Models of groups of individuals, populations, and communities are discussed. (Buchanan-Davidson--Wisconsin)
W76-08214

ABSTRACT MODELS OF FISH POPULATIONS,
V. V. Mehshythyh.
Available from the National Technical Information Service, Springfield, Va 22161, as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-5511, 1975, p. 90-112. 10 fig., 5 tab.

Descriptors: *Model studies, *Mathematical models, *Fish populations, *Methodology, Computers, Growth rates, Fish food organisms, Spawning, Energy transfer, Fish harvest, Feeding rates, Biological communities, Dynamics, Biomass, Algorithms, Foreign research.

The theoretical elaboration of modelling principles for food-fish populations on electronic computers is presented. A population of food-fish, where replenishment and growth are independent of external conditions, was used. Several fish population models are examined. To study questions concerning interaction with feeding, processes of qualitative variation in spawning schools, and the reciprocal influence of related generations, study of population from an energy point of view is necessary. This model was used to determine the influence of changes in the feeding basis on the dynamics of the population and on the catch. The greater the period of variation in the feeding basis, the more intricate the structure of the oscillations of the food-fish yield. Not every periodic change in food-fish yield should be related to periodic variations in the feeding basis. The results show the value in applying the energy principle to the modelling of a fish population, especially modelling of communities. Laws for the conservation of matter and energy make it possible to show a resemblance between the model and the original and to avoid mistakes. (Buchanan-Davidson--Wisconsin)
W76-08215

MODELS OF ACTUAL FISH POPULATIONS,
V. V. Mehshythyh.
In: National Science Foundation Technical Translation 73-5511, 1975, p. 113-146. 9 fig., 5 tab.

Descriptors: *Fish populations, *Model studies, *Computers, *Mathematical models, *Methodology, Spawning, Mortality, Perches, Sockeye salmon, Fishing, Forecasting, Predation, Fish harvest, Algrithms, Foreigh research.
Identifiers: Lake Tyuleny(USSR), Ozernaya River(USSR), Karlian Istmus(USSR), Kamchatka(USSR).

The practical application of principles for modelling fish-food populations on electronic computers is illustrates with data obtained on the perch population in Lake Tyuleny, on the Karelian Istmus. Population properties and behavior were defined by action exerted from external and internal parameters. After 20-25 years, the population always followed a regular cycle. An optimum fishing scheme which considers the cyclic nature of productivity is needed by the fishing industry. The sockeye or red salmon population of the Ozernaya River in Kamchatka was also studied. Correlations were determined between numbers spawning and egg survival. The model can be used for fishery forecasts, although coefficients of natural mortality were uncertain. Forecasts can be made for the year after spawning or longer, but satisfactory results were only obtained the first 2-3 years, then became meaningless. By using these models, an objective estimation of the influence of a certain parameter on forecast precision became possible. The model permits practical, quantitative correlations between deep sea and coastal fishing. It can be used to detect trends or estimate average values. Even if the results are only approximate, they may indicate factors which influence the food-fish population, yields, and the interdependence of variations in these values. (Buchanan-Davidson--Wisconsin)
W76-08216

MODELS OF POPULATIONS OF AQUATIC INVERTEBRATES,
V. V. Mehshythyh.
Available from the National Technical Information Service, Springfield, Va 22161 as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-5511, 1975, p. 147-178. 13 fig., 4 tab.

Descriptors: *Invertebrates, *Model studies, *Mathematic studies, *Methodology, Crustaceans, Fish food organisms, Populations, Computers, Productivity, Mortality, Predation, Reproduction, Biomass, Feeding rates, Growth rates, Age, Energy transfer, Foreign research.

Methods to model populations of fish food organisms are described. Formulae are given to express continuous time conceptions and for calculating biomass, its stability and the influence of the production process based on amount of food and predation. A population model includes the definition of operations of metabolic expenditures, and a total maximum ration of the biomass of the population of planktonic crustaceans in which the life cycle of each individual is examined separately with the growth and mortality as random variables. Algorithms are given of a generation or a population of individuals reproducing only once, of a population of planktonic crustaceans with an extended reproductive period, and a flow chart of the modeling algorithm of the probabilities within the model of a crustacean population. (Auen-Wisconsin)
W76-08217

ABSTRACT MODELS OF COMMUNITIES OF AQUATIC ANIMALS,
V. V. Mehshythyh.
Available from the National Technical Information Service, Springfield, Va 22161, as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-5511, 1975, p. 179-206. 14 fig., 1 tab.

Descriptors: *Methodology, *Model studies, *Digital computers, *Graphical methods, *Biological communities, *Aquatic animals, Equations, Food chains, Energy transfer, Biomass, Algorithms, Foreign research.
Identifiers: Formulae.

Studies of properties of aquatic organism communities with models constructed on the basis of differential equations give clear results only in simple cases; more complex situations require use of electronic computers. Frequently complete knowledge of dynamic properties of a system is not required. Graph theory studies of two predator-prey populations show that effective energy transfer in the trophic chain and the relation of the population's biomass in the community depend on many parameters. Properties of more complex communities can be determined without solving systems of differential or finite differences equations; however this method is unsuitable for study of transitional schemes of a community or reactions to sudden changes in external conditions. The correlations only reflect the balanced, stable state of the system. If parameters vary widely, the results may be unreliable. The graph theory method is clear and mathematically simple. A universal model suitable for communities with any number of populations is also described, which used a digital computer. Statistical and dynamic characteristics of communities of aquatic animals with trophic networks of any complexity can be studied by this method. However an element of the community was simplified: the state of the population is described by a single variable, its biomass. (Buchanan-Davidson--Wisconsin)
W76-08218

MODELS OF ACTUAL COMMUNITIES,
V. V. Mehshythyh.
Available from the National Technical Information Service, Springfield, Va 22161, as TT-73-55111, $9.75 in paper copy, $2.25 in microfiche. In: National Science Foundation Technical Translation 73-551, 1975, p. 207-264. 18 fig., 7 tab.

Descriptors: *Model studies, *Mathematical models, *Fish populations, Biloogical communities, Methodology, Mortality, Productivity, Reproduction, Fish food organisms, Spawning, Sockeye salmon, Algrithms, Predation, Biomass, Feeding rates, Perches, Fry, Histograms, Sticklebacks, Fluctuations, Dynamics, Yield equations.
Identifiers: *Lake Dalny(USSR), *Lake Razdelny(Karelian Istmus). U.S.S.R.

To understand perch fry mortality, a model representing interactions between zooplankton population and perch fry in Lake Razdelny on the Karelian Istmus, is described. Food was the factor regulating fish numbers during early development. A model of the relationship between fry and food organisms shows that when lake temperature increased slowly, fry levels were high, and food supplies small, only a few fish survived. When the water was warm, food supply large, and consumer numbers low, most fry survived. The model of trophic interaction between fry and prevailing plankton populations elucidated many peculiarities of fry survival and showed that the influence of food on fry was decisive. A model of the Lake Dalny pelagic fish community which contained sockeye salmon, three-spined stickleback, and lake char is used to describe cyclic population variations. The influence of coastal salmon fishing on temporal characteristics of the number and ichthyomass of the stickleback was strong and readily detected, but char populations did not depend on variations in salmon. Coastal salmon fishing influenced average values and temporal statistical characteristics of the Lake Dalny pelagic fish community. Broad generalizations about population dynamics and community numbers and biomass cannot be made from present knowledge with accuracy. (Buchanan-Davidson--Wisconsin)
W76-08219

STUDIES ON THE HOST SPECIFICITY OF THE EYEFLUKE DIPLOSTOMUM SPATHACEUM, IN BROWN AND RAINBOW TROUT,
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat.
For primary bibliographic entry see Field 5C.
W76-08302

REARING THE SEVAN TROUT AT THE AIGERLICH TROUT POND FISHERY, (IN ARMENIAN),
For primary bibliographic entry see Field 2I.
W76-08371

ECOLOGY AND PROSPECTS OF USING THE AMPHIPOD GAMMARUS (R.) BALCANICUS SCHAEF, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
For primary bibliographic entry see Field 2I.
W76-08410

AN EXPERIMENT ON THE FEEDING OF FRY OF CATFISH HETEROPNEUSTES FOSSILIS,
Bangladesh Agricultural Univ., Mymensingh. Faculty of Fisheries.
For primary bibliographic entry see Field 2I.
W76-08575

SAVANNAH RIVER LABORATORY ENVIRONMENTAL TRANSPORT AND EFFECTS RESEARCH ANNUAL REPORT - 1974.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W76-08596

ENTRAINMENT AND INTAKE SCREENING, PROCEEDINGS OF THE SECOND ENTRAINMENT AND INTAKE SCREENING WORKSHOP.
Electric Power Research Inst., Palo Alto, Calif.
EPRI Report No. 15, December 1974. 347 p, Editor Jensen, L. D., Held at the Johns Hopkins University, Baltimore, Maryland, on February 5-9, 1973.

Descriptors: *Conferences, *Entrainment, Intakes, Hydraulic structures, Screens, Fish, Plankton, Thermal stress, Mortality, Design.

The manuscript of the workshop proceedings presents a summary of state-of-the-art information relative to the effects of entrainment of planktonic organisms into cooling water systems and hydraulic intrapment of fish into intake and screening structures located in a variety of surface waters throughout the United States. A total of 34 papers is included. (See W76-08629 thru W76-08662) (Chilton-ORNL)
W76-08628

EVALUATION OF ENTRAINMENT EFFECT,
Oak Ridge National Lab., Tenn.
C. C. Coutant.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland on February 5-9, 1973. p 1-11, 2 tab, 16 fig, 8 ref.

Descriptors: Fish handling facilities, *Environmental effects, *Entrainment, Evaluation, Powerplants, Aquatic life.

A conceptual framework for analyzing the impacts of power plant entrainment on aquatic life and man's environment is presented. The framework is a linear sequence of environmental impacts which are identified as: the sources of potential biological damage associated with entrainment and impingement, the probability of involvement of susceptible organisms, the probability of direct biological damage, the population effects, and the social impact. The report does not explicitly include a format for considering all ecological complexity but it does provide a logical framework on which to build a site-specific analysis. (See also W76-08628) (Chilton-ORNL)
W76-08629

ZOOPLANKTON SURVIVAL IN COOLING WATER SYSTEMS OF FOUR THERMAL POWER PLANTS ON THE CALIFORNIA COAST-INTERIM REPORT. MARCH 1971-JANUARY 1972,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
For primary bibliographic entry see Field 5C.
W76-08630

ENTRAINMENT AND THERMAL EFFECTS ON A MYSID SHRIMP AND STRIPED BASS IN THE SACRAMENTO-SAN JOAQUIN DELTA,
California State Dept. of Fish and Game, Stockton. Delta Fish and Wildlife Study.
For primary bibliographic entry see Field 5C.
W76-08631

SUMMARY OF ENTRAINMENT RESEARCH AT THE MILLSTONE POINT NUCLEAR POWER STATION, 1970 TO 1972,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-08632

ENTRAINMENT STUDIES ON HUDSON RIVER ORGANISMS,
New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine.
For primary bibliographic entry see Field 5C.
W76-08633

HUDSON RIVER STRIPED BASS LIFE CYCLE MODEL,
Lawler, Matusky and Skelly Engineers, Tappan, N.Y.
For primary bibliographic entry see Field 5C.
W76-08634

ENTRAINMENT OF PLANKTONIC ORGANISMS INTO COOLING WATER SYSTEMS OF THREE MID-ATLANTIC THERMAL POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-08635

PHYTOPLANKTON ENTRAINMENT STUDIES AT THE INDIAN RIVER ESTUARY, DELAWARE,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 5C.
W76-08636

EFFECTS OF CONDENSER ENTRAINMENT ON ALGAL PHOTOSYNTHESIS AT MID-ATLANTIC POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-08637

EFFECTS OF CONDENSER DESTRUCTION OF ALGAE ON DISSOLVED OXYGEN LEVELS IN THE JAMES RIVER,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-08638

ENTRAINMENT OF ZOOPLANKTON AT THREE MID-ATLANTIC POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-08639

ZOOPLANKTON STUDIES AT MORGANTOWN,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5C.
W76-08640

THE EFFECTS OF ENTRAINMENT ON PHYTOPLANKTON AT THE MORGANTOWN STEAM ELECTRIC STATION, POTOMAC RIVER ESTUARY, SEPTEMBER 5-8, 1972,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5C.
W76-08641

MORGANTOWN ENTRAINMENT. PART IV. PHYTOPLANKTON TAXONOMIC STUDIES,
For primary bibliographic entry see Field 5C.
W76-08643

RESPONSE OF PHYTOPLANKTON TO THERMAL STRESS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W76-08644

ENTRAINMENT STUDIES AT TURKEY POINT ON BISCAYNE BAY: HAVE THERMAL EFFECTS AFFECTED THE PLANKTON OF BISCAYNE BAY,
Air and Water Research, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5C.
W76-08645

LABORATORY SIMULATION OF POWER PLANT EFFECTS: RESPONSE OF SOME ESTUARINE PHYTOPLANKTERS TO TIME TEMPERATURE COMBINATIONS,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5C.
W76-08646

TRAVELING SCREENS FOR TURBINE INTAKES OF HYDROELECTRIC DAMS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. E. Farr.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 199-203, 7 fig, 1 ref.

Descriptors: *Entrainment, *Screens, Fish, Fish behavoir, Intakes, Hydroelectric plants.

Modifications are reported in conventional vertical traveling screens which permit fish recovery rates without correspondingly large hydraulic head losses. The diverted fish enter gatewells above the intakes and pass through orifices into a central bypass conduit discharging at the tailrace. It was calculated that the system would be capable of diverting up to 90% of the seaward migrants out of the turbine intakes. (See also W76-08628) (Chilton-ORNL)
W76-08647

FISH DIVERSION SYSTEMS AND BIOLOGICAL INVESTIGATION OF HORIZONTAL TRAVELING SCREEN MODEL VII,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
E. F. Prentice, and F. J. Ossiander.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 205-214, 6 tab, 10 fig, 19 ref.

Descriptors: *Entrainment, *Screens, *Salmonids, Fry guiding, Mortality.

Tests were designed to gather information on the diversion efficiency of a horizontal traveling screen and to examine survival and the effect of impingement on the physical condition of young salmonids. Diversion efficiencies of the screen were about 97% or greater at normal velocities of 0.15 and 0.46 m/sec for fingerling and fry. No impingements were observed among fingerlings but fry readily impinged on the screen. At 0.15 m/sec velocity, survival of fry was independent of impingement time, but at 0.46 m/sec velocity, survival decreased as impingement time increased from 6 to 60 min. (See also W76-08628) (Chilton-ORNL)
W76-08648

MECHANICAL OPERATION OF HORIZONTAL TRAVELING SCREEN MODEL VII,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. E. Farr, and E. F. Prentice.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 215-222, 16 fig, 2 tab, 3 ref.

Descriptors: *Entrainment, *Screens, Salmonids, Mechanical equipment, Hydraulic machinery.

The mechanical and hydraulic features of a horizontal traveling screen which is designed to divert young salmon and steelhead trout are presented. Mechanical operation and performance assessment of a prototype are discussed and a number of recommendations are made for improvement of the screen. It was concluded that in general the concept of the screen is good in spite of operational, mechanical and hydraulic problems in the model. (See also W76-08628) (Chilton-ORNL)
W76-08649

VERTICAL TRAVELING FISH BASKET COLLECTOR,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
E. F. Prentice.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 223-224, 3 fig.

Descriptors: *Entrainment, *Mechanical equipment, Fish.

The study investigates the mechanical performance of a fish basket-collector which is designed to collect and remove fish and debris trapped in water intake canals and on intake screens. Effectiveness of a wash system is assessed in terms of proportional reduction in head loss during operations. (See also W76-08628) (Chilton-ORNL)
W76-08650

FISH PASSAGE THROUGH TURBINES, CONDUITS, AND SPILLWAY GATES,
Washington Univ., Seattle. Fisheries Research Inst.
M. C. Bell.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 251-261, 34 fig.

Descriptors: *Hydraulic equipment, *Diversion structures, *Entrainment, Dams, Conduits, Spillway gates, Turbines, Fish guiding.

Shearing action and mechanical damage were found to be the major causes of mortality of fish passing through various types of hydroelectric waterways. Other factors inside turbines that kill are the striking of fish by moving blades and the direct contact of fish with rigid parts of the equipment. It was noted that the fish in the center of a jet pass smoothly, but these in the outer layer are affected by the boundary conditions and are twisted and turned resulting in mechanical damage. The effects of cavitation which accounts for the decapitated fish and fish with missing pieces of flesh are discussed. Kaplan and Francis runners are discussed and it was found that Francis runners have less slack in their design as far as fish passage is concerned than do the adjustable Kaplan runners. (See also W76-08628) (Chilton-ORNL)
W76-08651

A FUNCTIONAL EVALUATION OF A LARGE LOUVER SCREEN INSTALLATION AND FISH FACILITIES RESEARCH ON CALIFORNIA WATER DIVERSION PROJECTS,
California State Dept. of Fish and Game, Stockton.
J. E. Skinner.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 225-249, 26 fig, 5 ref.

Descriptors: *Diversion structures, *Entrainment, *Fish handling facilities, Design criteria, Screens, California.

Identifiers: Sacramento River(Calif).

The objectives of the program described were to (1) develop biological design criteria for required fish facilities associated with a canal which would divert water from the Sacramento River to the Sacramento-San Joaquin Delta; and (2) develop operating criteria for the facilities. A primary concern was the development of a fish screen and other measures to minimize losses of fish, eggs and larvae from the Sacramento River. Observations on the swimming performance of salmon, steelhead and striped bass at varying water velocities showed that, in general, swimming performance varies directly with size and inversely with velocity. This relationship is critical for the smallest fish but diminishes as the fish get larger. A large louver screen and its effectiveness as a diversion device is discussed in relation to the swimming capabilities of various fish. (See also W76-08628)
W76-08652

NUMBERS OF INDIVIDUALS AND INJURY RATES OF FISHES CAUGHT ON REVOLVING SCREENS AT THE P. H. ROBINSON GENERATING STATION,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
A. M. Landry, Jr., and K. Strawn.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 263-271, 5 fig, 5 tab, 21 ref.

Descriptors: *Entrainment, *Screens, Fish, Mortality, Seasonal, Diurnal.

Samples taken during the 13 month study produced 68,518 fishes, comprising 83 species. February through June collections yielded more fish than other collections with March having the largest catch-per-effort totals of any month. In addition to this seasonal variation in catch, a diurnal variation was noted which was due to the light conditions making the screens vary in visibility. Injuries received by fish during impingement was varied. Water pressure or a combination of water pressure and floating mats of algae trapped and suffocated sick and weak fish. Small fish became gilled in the openings in the mesh. Impinged fish were also easy prey for blue crabs which were abundant in the intake canal during spring and summer. (See also W76-08628) (Chilton-ORNL)
W76-08653

ADAPTATION OF HYDRO FISH FACILITIES TO STEAM-ELECTRIC STATIONS,
Portland General Electric Company, Portland, Oregon, Department of Environmental Services.
G. J. Eicher.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 273-276, 24 ref.

Descriptors: *Entrainment, *Diversion structures, Hydraulic equipment, Electric power, Steam, Fish guiding.

Methods of fish diversion such as Wolfe traps, screens, louvers, and /electric barriers which are used at hydroelectric facilities are discussed as related to their possible use at steam electric facilities. It was concluded that the application of screening that is successful in hydro projects in many cases stands a good chance of being successful at steam electric stations and much of the experience gained with hydro is transferable. (See also W76-08628) (Chilton-ORNL)
W76-08654

CONVENTIONAL FISH SCREENING SYSTEMS AND SOME PROMISING ALTERNATIVES,
Kramer, Chin and Mayo, Inc. Seattle, Wash.
R. D. Mayo.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 277-279, 5 fig.

Descriptors: *Entrainment, *Hydraulic equipment, *Screens, Filters, Barriers, *Fish barriers, Fish handling facilities.

Screening systems are divided into four major categories for purposes of discussion; fixed screens, traveling screens, filter systems and behavioral barriers. The advantages and disadvantages of each of these types of systems with some alternatives to each is presented. (See also W76-08628) (Chilton-ORNL)
W76-08655

VULNERABILITY AND SURVIVAL OF YOUNG CONNECTICUT RIVER FISH ENTRAINED AT A NUCLEAR POWER PLANT,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
B. C. Marcy, Jr.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 281-288, 4 tab, 2 fig, 25 ref.

Descriptors: *Entrainment, *Mortality, Fish, Nuclear powerplants, Thermal stress, *Connecticut River.

Of the entrained species, 97.6% were alewives and blueback herring and 1.3% were white perch. Estimates of fish mortality due to mechanical damage during passage through the condenser cooling-water system averaged approximately 80%. Mortality attributed to heat shock or prolonged exposure to temperatures above 28 degrees C was 20%. The injection of sodium hypochlorite as a biocide produced no measurable differences in mortality. (See also W76-08628) (Chilton-ORNL)
W76-08656

STATUS OF AIR BUBBLE FISH PROTECTION SYSTEM AT INDIAN POINT STATION ON THE HUDSON RIVER,
Consolidated Edison Co. of New York, Inc., New York. Office of Environmental Affairs.
R. A. Alevras.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 289-291, 1 tab, 1 fig.

Descriptors: *Diversion structures, Fish, Seasonal, *Hudson River, New York.
Identifiers: *Air bubblers.

Various types of air bubbler systems were evaluated. The average number of fish collected per day during the test period exceeded the daily average during sampling periods before and after the test. The difference between the collecting periods may indicate a change in the density of fish in the vicinity of the intake. It was tentatively concluded that the air curtain did not appear to repel fish and may attract fish during hours of darkness. (See also W76-08628) (Chilton-ORNL)
W76-08657

PRELIMINARY STUDIES ON THE EFFECTS OF AIR BUBBLES AND INTENSE ILLUMINATION ON THE SWIMMING BEHAVIOR OF THE STRIPED BASS (MORONE SAXITALIS) AND THE GIZZARD SHAD (DOROSOMA CEPEDIANUM),
Westinghouse Electric Corp., Phildelphia, Pa. Environmental Systems. Dept.
P. N. Bibko, L. Wirtenan, and P. E. Kueser.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 293-304, 9 fig, 5 tab, 3 ref.

Descriptors: *Entrainment, *Diversion structures, Fish behavior, Striped bass, Light intensity.
Identifiers: Air-bubblers.

This study was performed specifically in an effort to (1) assess the influence of water velocity and water temperature on fish swimming behavior and (2) determine the efficiency of an air-bubble screen and intense illumination as deterrent devices. In still water both striped bass and gizzard shad swim in a random manner but when exposed to water velocity, fish orient into and swim against the on-coming current. The tendency of fish to cross air bubble screens was related to water temperature. The air-bubble screen seemed equally effective in deterring bass passage during the day and night when little ambient light was available. Intense illumination may be characterized as only a temporary deterrent. (See also W76-08628) (Chilton-ORNL)
W76-08658

EXPERIMENTAL STUDIES IN GUIDING MARINE FISHES OF SOUTHERN CALIFORNIA WITH SCREENS AND LOUVERS,
Ichthyological Associates, Inc., Middleton, Del.
V. J. Schuler.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 305-315, 2 tab, 10 fig, 5 ref.

Descriptors: Model studies, *Diversion structures, *Screens, *Fish guiding, Marine fish, California.

The program goals presented are concerned with determining and investigating those behavioral characteristics of marine fishes which can be used as parameters in the modification of existing, and the design of future, fish diversion-removal systems. This was a model study in which all parameters except fish size, velocity, and louver spacing were on a reduced scale. Test species guided better along an array of louvers than along screens and the highest degrees of guidance occurred with louvers spaced 2.54 cm apart set at 30 and 20 degrees to flow and with vanes normal to frame. (See also W76-08628) (Chilton-ORNL)
W76-08659

A HIGH CAPACITY SAND FILTER FOR THERMAL POWER PLANT COOLING WATER INTAKES PART I: MODEL STUDIES AND FOULING CONTROL TECHNIQUES,
Washington Univ., Seattle. Fisheries Research Inst.
Q. J. Stober, C. H. Hanson, and P. B. Swierkowski.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 317-334, 11 tab, 13 fig, 10 ref.

Descriptors: Model studies, *Filters, *Cooling water, Sands, Particle size, *Fouling, Control systems, *Entrainment.

A model rapid sand filter was tested and the optimal size for the anthracite-gravel filter media was found to be between 3/32 and 5/16 in. The coarseness of the media was restricted by the quantity and velocity of backwash water required to achieve bed expansion. Six fouling control techniques were evaluated, including backwash with ambient sea water, anoxia, single dose chlorination, heat treatment, chlorination and heat treatment during backwash and daily 2-hr

chlorination. Based on barnacle abundance and growth rates, the most effective fouling control techniques tested were backwashing with heated sea water, daily chlorination, and anoxia. (See also W76-08628) (Chilton-ORNL)
W76-08660

A HIGH CAPACITY SAND FILTER FOR THERMAL POWER PLANT COOLING WATER INTAKES PART II: DESIGN CONCEPT,
Northwest Nuclear Power Associates, Seattle, Wash.
H. V. Strandberg.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 335-343, 9 fig, 5 ref.

Descriptors: *Design, *Filters, *Thermal powerplants, Cooling water, *Entrainment.

The design concept presented is capable of providing cooling water at the rate of 1500 cubic feet per sec. Various aspects of the design which are presented include properties of the water to be filtered, filter rates, backwash requirements, operation and maintenance. Attractive attributes of the rapid sand filter include a low approach velocity, free tidal flow across the filter surface, and low profile and space requirements. Engineering drawings are presented to illustrate important features of the design. (See also W76-08628) (Chilton-ORNL)
W76-08661

DEVELOPMENT OF BIOLOGICAL DESIGN CRITERIA FOR FISH SCREENS AND BARRIERS,
Kramer, Chin and Mayo, Inc., Seattle, Wash.
J. L. Congleton.
In: Entrainment and Intake Screening, Proceedings of the Second Entrainment and Intake Screening Workshop held at The Johns Hopkins University, Baltimore, Maryland, February 5-9, 1973. p 345-347, 4 fig, 3 ref.

Descriptors: *Entrainment, *Design criteria, *Screens, Barriers, Fish behavior.
Identifiers: Swimming performance.

Factors to be considered in design criteria are identified as swimming performance, behavior and impingement tolerance. The need for standardization in these areas is emphasized. (See also W76-08628) (Chilton-ORNL)
W76-08662

BIOLOGICAL BACKGROUND OF THE NEW ELEMENT OF STURGEON ARTIFICIAL REARING METHODS, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
A. F. Gun'ko.
Vopr Ikhtiol. 14(6), p 1134-1136, 1974.

Descriptors: *Fish hatcheries.
Identifiers: *Fish breeding, *Sturgeon, Experiments.

Experiments with industrial breeding of sturgeons with high viability for many years yielded good quality sturgeon. Estuary water zooplankton and crustaceans for food and coexistence with other fish were necessary. Water volume, breeding periods, number of fish bred, viability of young fish and the daily food requirement were determined in the process of breeding young sturgeons in the Miusskii and Akhtanizovskii estuaries, USSR.--Copyright 1975, Biological Abstracts, Inc.
W76-08663

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ANNUAL REPORT, WATER RESOURCES RESEARCH ACTIVITIES UNDER PUBLIC LAW 88-379, FISCAL YEAR 1975.
Georgia Inst. of Tech. Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 9D.
W76-08163

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT, WATER RESOURCES RESEARCH ACTIVITIES UNDER PUBLIC LAW 88-379, FISCAL YEAR 1975.
Georgia Inst. of Tech. Atlanta. Environmental Resources Center.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 294 $5.50 in paper copy, $2.25 in microfiche. Report ERC-1075, August 1975. 105 p. OWRT A-999-GA(3).

Descriptors: *Water Resources Research Act, *Projects, *Georgia, Research and development, Administration, Administrative agencies, Information exchange, Research priorities, Water resources.

Activities of the Environmental Resources Center in administering the Federal Water Resources Research Act in Georgia during Fiscal Year 1975 were reported. The Center is in the Office of Interdisciplinary Programs at the Georgia Institute of Technology. One of its main activities is managing the Allotment and Matching-grant projects in the Georgia Water Resources Research Program, for which Federal funds are provided by the Office of Water Research and Technology, U.S. Department of the Interior. The three parts of the annual report present summaries of: (1) Center research and information dissemination activities, (2) allotment projects, and (3) matching-grant projects during FY 1975. Eighteen allotment and twelve matching-grant projects undertook active research or were being completed. In addition, three new allotment projects and one new matching-grant project were selected for the next year. Lists of priority research needs developed by a Research Program Development Committee and Center publications were given. (Sims - ISWS)
W76-08163

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

LASER APPLICATIONS TO ATMOSPHERIC SCIENCES - A BIBLIOGRAPHY,
Old Dominion Univ., Norfolk, Va.
F. S. Harris, Jr.
Contractor Report NASA CR-2536, June 1975. 134 p, 1460 ref. NASA NGR 47-003-068.

Descriptors: *Bibliographies, *Remote sensing, *Atmosphere, Cloud physics, Clouds, Aerosols, Winds, Temperature, Turbulence, Air pollution, Instrumentation, Information retrieval, Documentation, Publications, Meteorology.
Identifiers: *Lasers.

This report contains a bibliography of 1460 references on the applications of lasers to atmospheric sciences. The subjects covered include: aerosols; clouds; the distribution and motion of atmospheric natural and man-made constituents; winds; temperature; turbulence; scintillation; elastic, Raman and resonance scattering; fluorescence; absorption and transmission; the application of the Doppler effect and visibility. Instrumentation, in particular lidar, is included, also data handling, and interpretation of the data for meteorological processes. Communications, geodesy and rangefinding are not included as distinct areas. The application to the atmosphere is covered, but not the ocean or its surface. (Sims-ISWS)
W76-08323

WATER YIELD IMPROVEMENT BY VEGETATION MANAGEMENT: FOCUS ON ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 03B.
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CHEMISTRY AND EFFECTS OF CHLORINE IN AQUATIC SYSTEMS, A SELECTED, ANNOTATED BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn. Ecological Sciences Information Center.
For primary bibliographic entry see Field 05C.
W76-08592

10F. Preparation Of Reviews

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
For primary bibliographic entry see Field 05C.
W76-08162

WATER YIELD IMPROVEMENT BY VEGETATION MANAGEMENT: FOCUS ON ARIZONA,
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Flood Plain Information: Colorado River and Rifle, Government, Hubbard Gulch Creeks, Rifle, Colorado.
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ARMY ENGINEER DISTRICT, SAN FRANCISCO, CALIF.
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ARMY ENGINEER DISTRICT, VICKSBURG, MISS.
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- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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